

ANNUAL HOME-IDEA ISSUE

POPULAR SCIENCE

SEPTEMBER • 35¢ *Monthly*

Shares
Garage
with
Compact
Car

PAGE 152

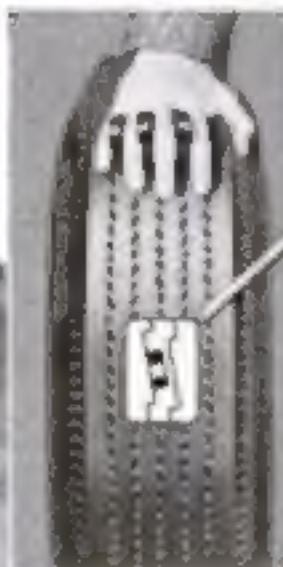


SPECIAL:

Let's Get Rolling on Car Safety!

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ARMSTRONG SAFETY DISCS CAN SAVE YOUR LIFE!



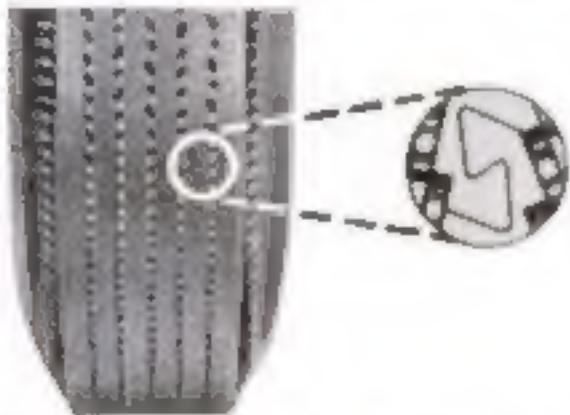
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Radar spotter: A squeal says "cope ahead." P. 61



Renault RLA: How come no grease fittings? P. 58



Lefties: Pity the poor southpaw. P. 103

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Popular Science

September, 1961

Cover photo by W. W. Morris and R. D. Borst

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PS Readers

TALK BACK



Why Can't Johnny Figure?

IN PHOENIX, Ariz., I got two tickets for going through yellow lights. There, lights are set for three-second amber and you must clear before the red. At 35 m.p.h. a car goes 154 feet in three seconds. It takes 110 feet for a safe stop, car length is 18 feet, and the street is 50-60 feet. This makes 178-188 feet to be cleared—including a zone of 24 feet or more in which you can't avoid a violation.

At a public meeting in Phoenix, I had to work the above problem twice on a blackboard before a city engineer admitted that I was right. Why make studies? Simple arithmetic seems adequate.

Later I wrote to the Safety Engineering School at one of the big universities. The director replied that three seconds is ample to cover 150 feet and get through a yellow light at 35 m.p.h. But a manual put out by the Department of Agriculture calls for a *minimum* of five seconds. I pull a 27-foot trailer, and I need all five seconds.

Our education system sure is going downhill. When the director of a traffic school can't figure his way through a traffic light, we've really hit bottom.

RALPH KYLE, Homestead, Fla.

The Case for the Rule

WE READ with astonishment the letter from Dr. A. B. Craig [June] detailing his distrust of rules and—we assume—measuring devices of all kinds.

Would he outlaw airplanes because of an occasional mishap? Would he forego electricity because a fuse blows? One unfortunate soul accidentally cuts off a piece of his rule and the doctor advises a re-

turn to the Middle Ages, measuring with thumb, hand, foot, or nose.

The wood folding rule is always high on the list of basic tools for all handymen, whether mechanics by trade or professional men seeking relaxation in their basement workshop.

S. A. SCHNEIDER, Vice-Pres.
Durall Tool Corp., Yonkers, N. Y.

I'd Like to See Detroit Make...

WHY doesn't somebody come up with a four-speed hand shift to these specs: fourth speed to be direct but free-wheeling teamed with a low-ratio (2.75:1) rear end for open-road, high-speed travel; second and third for driving in traffic; first with a higher ratio for real low-gear loads, higher than now available.

I'd also welcome the return of the easy shifting my '54 Dodge had. You could push it from first to second with one finger, and no hunting.

MARTIN HUIKKO, Litchfield, Minn.

Deprived of His Java

ALAS, that \$1,500 coffee machine ["How a Coffee Machine Works," May] can't dispense coffee the way I, and many other folks, like it. The selector



panel shown gives me a choice of every combination of coffee, cream, and sugar except the one I prefer: cream, no sugar.

H. BUTLER, Des Moines

Don't Blame It on Gus

AFTER reading "Gus Separates the Men from the Boys" [June], I am afraid that he has separated me from some of the basic principles of trouble-shooting. As Aircraft Maintenance Officer of Patrol

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Squadron Twenty-Four, I must question Gus's "with a faulty exhaust valve, I would have heard it leaking into the crankcase when I removed the breather-cap valve."

DANIEL J. SLIWINSKI,
Lt. Cmdr., U.S. Navy.

... IF GUS WILSON can put pressure in the top of a cylinder and hear a valve leak in the crankcase—boy, has he got something wrong!

ARNOT J. JEFFERS, Radcliff, Ohio.

... A PRINTER's gremlin seems to have swiped a few lines from the Gus Wilson piece. I am sure that experienced mechanics had no trouble supplying the missing text, but some readers might possibly have become confused.

VLADIMIR GIRSS, Oakley, Calif.

You are absolutely right about the error in the June Gus Wilson story. But, as reader Girss guessed, it wasn't Gus



who goofed—it was the printer and the proofreaders who failed to notice that several lines of type were somehow omitted from the text.

Originally, Gus's diagnosis read like this: "With a faulty exhaust valve I would have heard air leaking into the exhaust pipe. With a faulty intake valve I would have heard it leaking into the carburetor manifold. With leaking rings I'd have heard it leaking into the crankcase when I removed the breather-pipe cap."

Thanks for keeping us on the ball.

Hint for Sign Makers

TELL Mr. Corey to use the remains of a broken tempered auto glass for the letters ["Reflective Sign from Glass Chips," May p. 125] and he won't need to break up scrap glass. When tempered glass breaks, it practically explodes—no piece is more than $\frac{1}{4}$ -inch square.

A. L. MELCHER, Wisner, Nebr.

CONTINUED



*Autolite, the sparkplug that cleans itself
while you drive,
is now standard equipment on the Ford Family of Fine Cars.*

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The Autolite Power Tip is longer than the tip of ordinary plugs. It extends much deeper into your engine. Deposits are literally burned off by the exploding gasoline.

If your present plugs are killing the pep and mileage in your car, try Autolite, the spark plug that cleans itself while you drive.

AUTOLITE  SPARK PLUGS

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Word from the Animal Lovers

FROM the spelling of the names, I'd guess Tico and Tina ["My Two Dogs Never Meet," May] must be male and female. Considering that Tina is only six months old, I think her owner was a little premature in the construction of his elaborate maze—time should take care of the feud between the two.

Or maybe he figures it as a deterrent to batches of unwanted pups? If so, one thing puzzles me: What will happen



when Tina becomes very attractive to Tico and Tico decides to linger in pen A, waiting for his glamor pup, instead of passing on to pen B as he should? Unless I misread the drawing, it seems he has to pass through Tina's pen to get to his own. Somebody had better work fast on this problem unless there are lots of kids in the neighborhood who'd just love to take home a puppy.

L. L. HOWELL, Scranton, Pa.

... If you wish to keep me as a reader, keep articles on murdering our wildlife out of POPULAR SCIENCE. I refer specifically to "ABC's of Crow Hunting" [Apr.]. Leave that stuff for magazines that cater to "sportsmen," another name for sadists.

W. F. HECKMAN, Hillsboro, Ore.

... I SAY Mr. Laycock doesn't know his turtles ["Nature's Most Successful Animal," Apr.]. The turtle captioned "Prehistoric Monster" is either a Troost or Map turtle—a fresh-water turtle—and it cannot pull in all its extremities when mature. Its humped back has nothing to do with it.

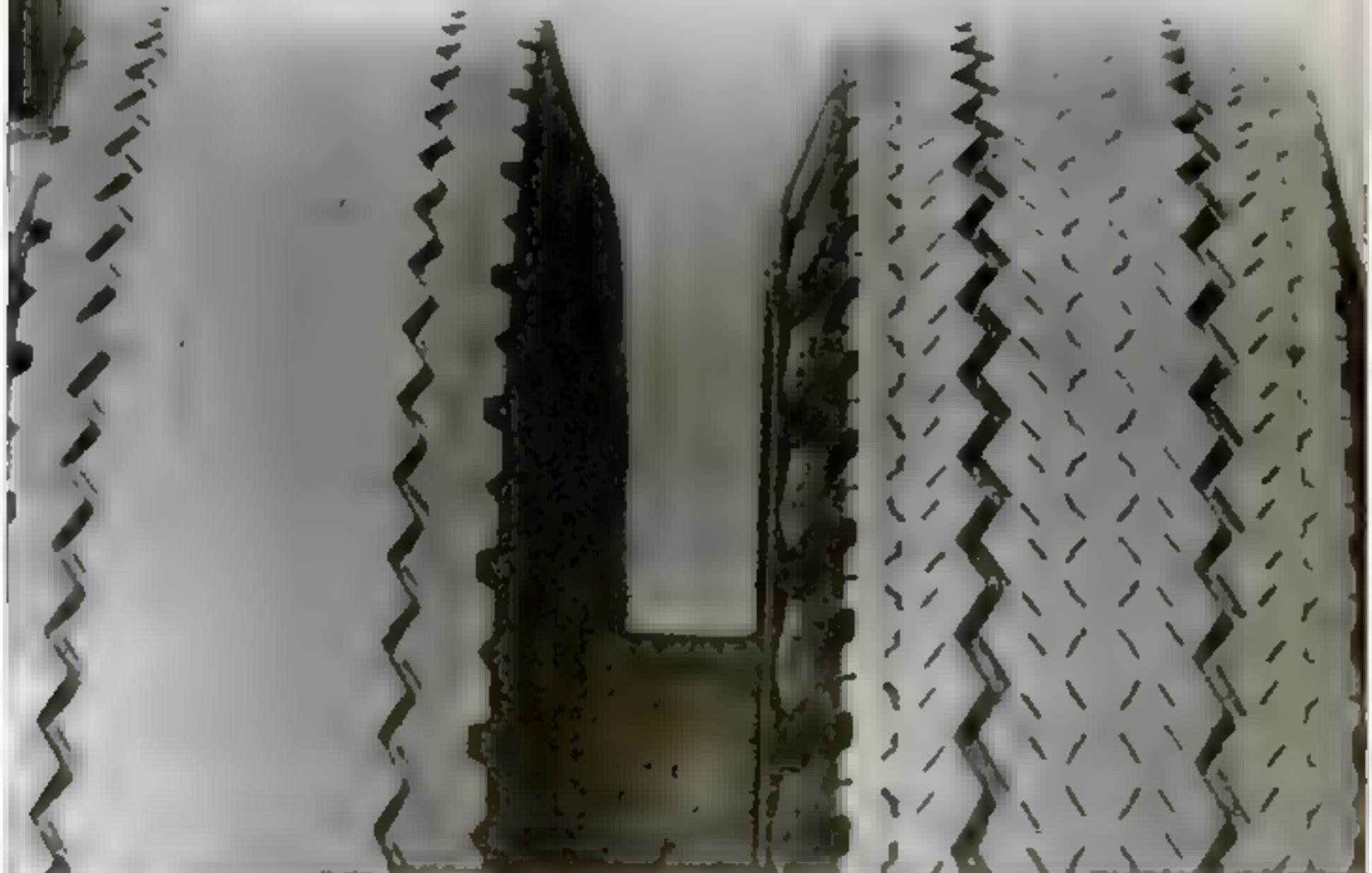
LEON HOLUB, Island Park, N.Y.

Gumbo-Loving Trencher

WHO says the Bus Brown machine is not successful in hard ground ["The Machine Way to Dig Ditches," Apr.]? I own one of these trenchers and it's sure good. My state has some of the toughest gumbo

When other
truck tires
are ready
for recaps . . .

this
Firestone
TRANSPORT-100
is still
ready to roll



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H. B. McMILLAN, Draper, S. D.

Tips-to-Share Department

To MAKE it impossible to "raise" a check I've written, I stick cellulose tape over the amount. After trying many ways of removing the tape, I'd say it's impossible to do so without damaging the check. I think my protective system is as foolproof as many requiring special equipment.

R. RAMNATH, Bombay, India.

... MY BROTHER and I make up our own goop for cleaning our car engines. Instead of paying for high-priced cleaning fluid, we mix some highly concentrated liquid detergent (purchased for dish washing) and kerosene. When the



mixture is sprayed on the engine from a bug-spray can, it cleans as well as the commercial stuff and at half the price.

JARED SMITH, Neptune Beach, Fla.

... I MADE an interesting discovery while playing around with laundry bleach. When an old felt pen (used for inking in posters) is cleaned with carbon tetrachloride and refilled with liquid laundry bleach, it makes a fine ink eradicator. And it's a lot simpler to use than the old two-bottle ink-eradicator routine.

DAVID PIERCE, Detroit.

... WELDING a nut on the shank of a screwdriver so you can get extra leverage with a wrench ["Hints from the Model Garage," June] brings to mind a handy idea thought up by my brother. He had one of those multiple screwdriver deals with a half-dozen shanks and one handle. One day he exerted too much pressure and thereafter had the shanks but no handle. But for extra leverage, and better control while utilizing it, he put a screwdriver shank in a tap wrench. This

What to do about high repair bills...



for about half your driving

Your engine needs an overcoat

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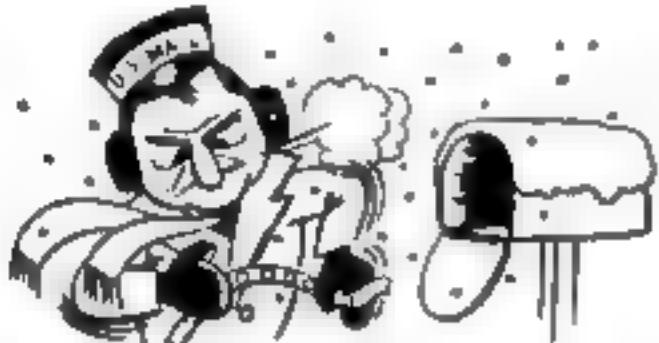


dodge surprised and delighted me. I think it every bit as clever and ingenious as any I've seen published.

A. C. CRAFT, Santa Ana, Calif.

Pity the Poor Mailman

STICKING coins on cellophane tape and hanging it in a mailbox may seem like a clever idea to Mr. Eagan [Short Cuts and Tips, June, p. 175], but not to me, a mailman. It's a time waster and it's par-



ticularly disagreeable in winter. The recommended practice is to put coins in an envelope or a spring clothespin. The Post Office Department furnishes stamp-requisition envelopes on request.

I'd never make it around my route if many people were to follow your cellophane tape hint.

W. H. CLISTER, Markleyburg, Pa.

LOOKING FOR LONG WEAR IN SERVICE SHOES?

TRY  MONTGOMERY WARD SHOES

WITH NEOPRENE SOLES!



Ask for No. 7363

SATISFACTION GUARANTEED or your money back! 

Take toughest jobs in stride in these sturdy Montgomery Ward service shoes. With their supple, elk-tanned leather uppers, seamless, one-piece backs, thickly cushioned insoles and exclusive "comfort-curve" tops, they're the "easiest" work shoes you ever wore!

They're also extra long-wearing because soles are of rugged, durable Du Pont neoprene... stitched throughout with rotproof Dacron® thread.

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You'll find soles and heels of neoprene on today's finest work and safety shoes!

Ask for neoprene soles the next time you buy service shoes



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

We Like Our Way Better

THAT hint for starting a flooded outboard [Apr., p. 139], is for the birds. An easier method that can be used with safety anywhere at the dock or on open water is this: First, without disturbing the carburetor settings, put the throttle control at start position and make sure the motor is out of gear. Sit down, shut off fuel valve or disconnect fuel line from motor. Then push the starter button or give five or six good yanks on the starter cord and, if flooding was your trouble, the outboard should start right away.

There is usually enough gas in the carburetor to run your motor until you can connect the fuel line or open the fuel valve. At any rate, you'll be on your way in less time than it would take to find a rope for your method.

ROYDEN WASSON, Lakefield, Ont.

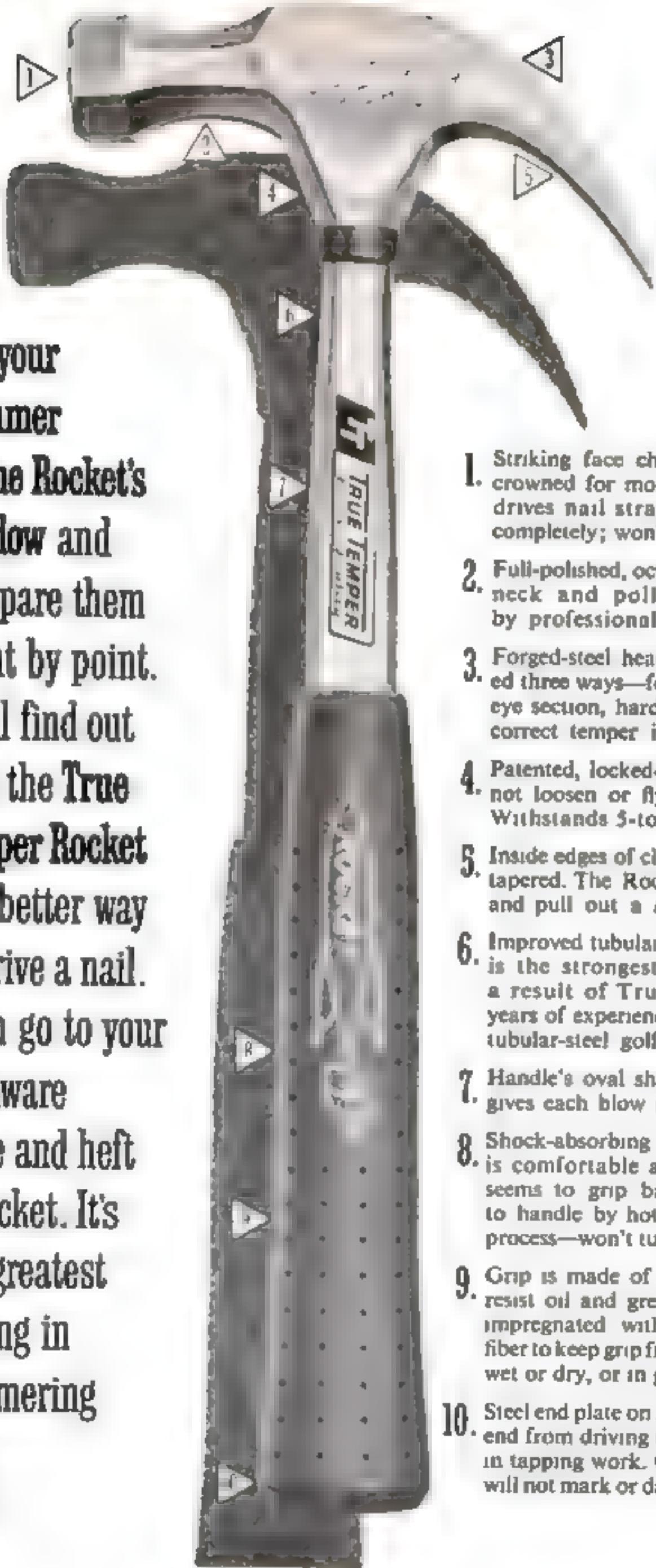
Your method is outlined in most outboard-motor manuals. However, disconnecting the fuel line won't keep the motor from continuing to flood itself with gas drawn from the carburetor, at least until the carb is sucked dry.

Opening the throttle to its widest position
CONTINUED

Lay your hammer in the Rocket's shadow and compare them point by point. You'll find out why the True Temper Rocket is a better way to drive a nail. Then go to your hardware store and heft a Rocket. It's the greatest feeling in hammering.

No. A16

\$5.49



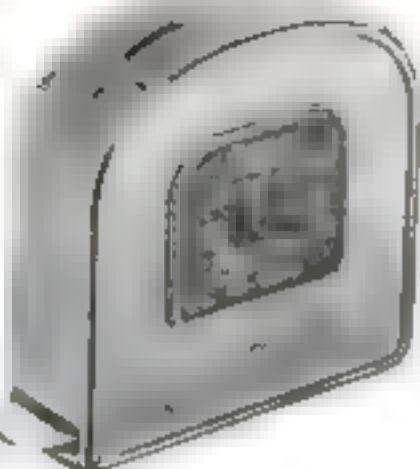
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2. Full-polished, octagon-pattern neck and poll—preferred by professional carpenters.
3. Forged-steel head, heat-treated three ways—for strength at eye section, hardness of face, correct temper in the claws.
4. Patented, locked-on head will not loosen or fly off in use. Withstands 5-ton pull tests.
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6. Improved tubular-steel handle is the strongest made. It's a result of True Temper's years of experience in making tubular-steel golf-club shafts.
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tion admits air to the cylinders. When flooded, any engine needs air in large quantities to clear itself and encourage combustion. With the throttle wide open, sometimes a single yank on the starter cord will fire up a flooded motor.

As explained, many motors limit the throttle in neutral, and it's necessary to shift into forward in order to open the throttle wide. As for the rope—don't you carry one for anchoring or tying up?

Oh, My Aching Back!

THAT boat your artist drew to show a new flexible boat hitch ["New Ideas from the Inventors," July] has a real novel seating arrangement. Was it planned for



a back-seat driver or has the owner long arms or maybe a bad crook in his back? Personally, I prefer the seat and steering wheel on the same side.

C. J. PRITLOVE, Guelph, Ont.

Just What the Man Ordered

THE man who wants a mud flap for the rear of his station wagon to keep the back window clean ["I'd Like to See Them Make," June] is in luck. We have been making such a flap since July, 1960.

PETER SHOEMAKER, Pres.
Polaris Corp., Dearborn.

Barrel Plane and Thunderchief

I REALLY enjoyed building your ducted-fan flying model [June]. It took about 6½ hours. I modified the landing gear,



using 1/16"-diameter wire and extending it clear through the wings so it wouldn't break as easily on hard landings.

EDDIE GUINET, Muncie, Ind.



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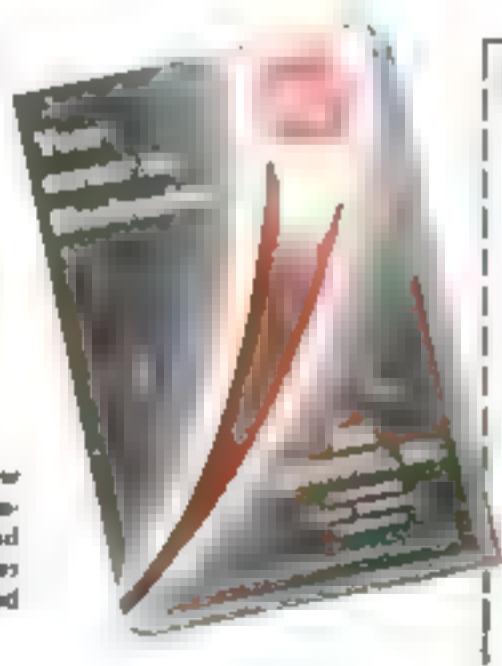
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Build Your Own Bomber

I'D LIKE to pass along to model-plane hobbyists a bit of information I've just picked up. Anybody interested in building the Air Force's supersonic F-105D all-weather fighter-bomber can



get plans from the Republic Aviation Corp., Farmingdale, N.Y. The plans are for solid-model construction.

A. J. CONDON, Trenton, N.J.

Anybody Got the Answer?

TIME marches on, but I'm still befuddled and bewildered. That plane forced into a "Tree-point landing" [Picture News, Apr. p. 100]: I've looked at it and looked at it, but never solved the puzzle. How did they get the plane down?

PVT. T. C. BARBER, Sacramento, Calif.

We'd say the simplest way would be with a big crane.

Can You Clear Up His Trouble?

CAN anyone tell me how to prevent my windshield wipers from producing smears instead of two clear arcs, as they did years ago? What has caused the change—road tars, diesel-exhaust fumes? Sometimes washing the glass and blades with detergent works fine. Sometimes it doesn't. And don't tell me that I've been using a silicone polish on the glass. I haven't.

PHILIP GARAND, Kansas City, Mo.

Solution, anyone?

One for the Road

MAY I add to the driving tips in your mail? This one gives the careful driver a better view of left-hand traffic on parkways and turnpikes: Adjust the inside and outside mirrors so that the fields of vision overlap slightly. That way you eliminate blind spots—a car's image will appear in one mirror before it completely leaves the other.

JAMES P. RUTH, Newark.

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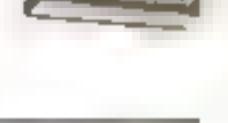
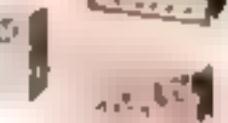
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The month in science

How to colonize Venus. The planet closest to Earth is Venus (it swings in to 25,000,000 miles). It is also one of the most mysterious. That's because you can't see the planet, only the pale, lemon-yellow clouds that cover it all the time. The mystery may be cleared up fairly soon: The Russians have sent a fly-by rocket probing past Venus (not very close, though), and we're planning to launch a Venus probe of our own next year.



Venus photographed in blue light at Mt. Wilson

a lot of hydrogen-carbon compounds, they would react with water to make all that carbon dioxide—and leave the planet coated with leftover hydrocarbons.)

4. It's an arid, windswept desert blanketed by dust clouds. (Until recently, not a trace of water could be detected.)

Commented Sagan in his report in the journal *Science*, "Those planning manned expeditions to Venus must be exceedingly perplexed over whether to send along a paleobotanist, a mineralogist, a petroleum geologist, or a deep-sea diver."

New evidence, Sagan thinks, blasts all these theories except No. 4, and this is not entirely right. The principal clue is temperature. Venus is apparently heated by a powerful greenhouse effect—incoming sun heat is trapped by the heavy carbon dioxide atmosphere and the cloud layer. The surface runs around 600

Meanwhile, Carl Sagan, researcher at the University of California, has compared bits and pieces of astronomical evidence to deduce the nature of our old Evening Star (most inhospitable, he says), and to propose a weird scheme for making it comfortable for human space settlers ("microbiological planetary engineering," he calls it).

Since no one can see the surface of Venus, scientists have felt free to let their imaginations run, and they sure did. There are four theories, all seriously proposed by recognized experts, and all wildly different:

1. It's dripping wet, covered with swamps. (The clouds were assumed to be water vapor, like our clouds.)

2. It's sunk in a global ocean of Seltzer water. (Much carbon dioxide was detected; this would carbonate the ocean.)

3. It's covered by a huge pool of oil. (If there were originally

CONTINUED

The month in science continued

degrees F., more than enough to dry out a swamp, evaporate a Seltzer ocean, or destroy an oil slick.

There can't be any liquid water. The clouds are ice crystals, but they are 30 miles up, where it's cold. It never rains. The surface is a dead, dry wasteland, eroded by the wind. The winds should be mild breezes, since the sun's heat goes mainly into warming up the heavy atmosphere, instead of moving the atmosphere around the way it does on earth.

No living thing we know about could exist under such conditions. Some life might carry on in the cool upper atmosphere, just under the clouds. There's not much chance that it does now, because it is unlikely that life ever got started on Venus—life brews slowly in a warm thin soup, and that Venus never seems to have had.

This dismal geography does not discourage Sagan. To make Venus resemble home sweet home, all you have to do is lower the temperature and set some oxygen free in the atmosphere. That's all. Sagan thinks blue-green algae will turn the trick. (It looks as if well-trained algae are as essential to space explorers as the compass was to Columbus.) Here's how:

The algae—microscopic plants that will float in the air—are squirted into Venus' clouds. There, using carbon dioxide from the atmosphere, water from the clouds' ice crystals, and sunlight, they manufacture carbohydrate and release free oxygen.

This uses up some water, which is scarce on Venus. You have to get it back. Very conveniently, the carbohydrate-fattened algae float down to lower, hotter regions of the atmosphere. The heat there roasts the carbohydrate, releasing carbon and water.

These two reactions build up the oxygen supply at the expense of carbon dioxide. As the carbon dioxide goes, the greenhouse effect becomes less efficient and the temperature drops. As the temperature drops, carbohydrate roasts more slowly, releasing less water. The loss of water vapor cuts the greenhouse effect and the temperature still more.

When the surface cools below the boiling point of water, you have it made. Pools of liquid water form. Then it rains. The rain brings on the "Urey equilibrium"—back-and-forth reactions between carbon dioxide and common types of rocks that stabilize the amount of carbon dioxide gas in the atmosphere. (These reactions won't go without rain, which triggers the chemical processes and stirs things up.) After a while, the Urey equilibrium will establish a carbon dioxide level much like that on Earth, the greenhouse effect will slack off more, and Venus will begin to feel like Florida.

Bait for termites. A new weapon for getting at termites, which—despite effective insecticides—munch through hundreds of millions of dollars worth of house framing every year, has been turned up by researchers of the U.S. Forest Service and the University of Wisconsin, at Madison. It is a clear oil that attracts termites the way cheese attracts mice and could be used the same way. The pure bait was extracted from the voracious bugs' favorite dish: pine wood riddled with brown-rot fungus.



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PS Puzzlers

By Joan Steen

Some September leaves—to burn you up... Answers on page 218



Estimating the Gravity of the Situation

FORGIVE the pun, but that's exactly what I want you to do.

The noted physicist George Gamow in a recent article described life on a spaceship far from any large gravitating masses. As long as the ship is in uniform motion, he notes, people and objects aboard will experience weightlessness. But if the rocket motors accelerate, people and objects will be pressed against

the wall opposite to the direction of motion. (That becomes the floor.)

Now suppose under conditions of acceleration a person on board performs Galileo's experiment. He takes two balls, one wood, one iron, and drops them from the same height. What will happen? Can you describe how it would appear to a person inside the ship? To someone outside?



THREE are 2,400 ways of solving this coin puzzle. The trouble is, if you see one way, you'll probably see the rule for all the others. And if you don't—you just kick yourself.

Five coins are placed at the top and bottom of a piece of paper, as shown. You are to remove four of them, leaving the others in place. Now replace the four so that you can form a figure consisting of five straight lines each passing through four coins.

TWO numerical quickies—one's for real, the other's a trick.

First, can you arrange this row of eight 8s to make a 1,000?

8 8 8 8 8 8 8 8

You're allowed to use the ordinary signs of arithmetic plus innumerable parentheses.

Second, can you add five and six in such a way that the sum is nine? (Don't say we didn't warn you.)



WHAT'S the fair fare? Jones rents a car to go from A-town to C-town and back for \$10. At B-town, midway in his journey, he picks up friend Smith who wants to go on to C-town and then be dropped off at B-town on the return trip. How much should Smith pay if they are to share expenses fairly?

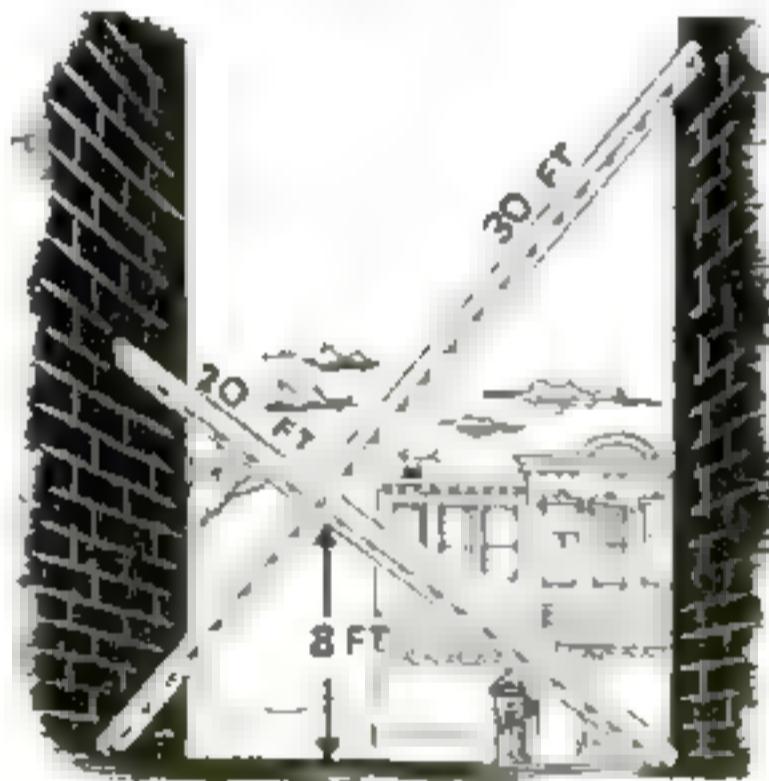
PS Puzzlers continued



A LITTLE algebra—really very little—is all you need to solve this horse-and-buggy puzzle.

A big company decided to stage an old-fashioned Labor Day picnic for its employees, complete with horse-drawn wagons. On the way out to the picnic grounds, 10 of the wagons broke down

so they had to put one extra person on each of the wagons left. Coming back, 15 more wagons developed trouble, so they again had to redistribute the people. By the time they reached town, each wagon carried three more persons than it had held in the morning on the way out. How many went on the picnic?



Puzzle of the month

HERE'S a deceptively simple-looking problem that can be solved in a number of ways—mostly complicated. See if you can find an easy path. I played a hunch that worked.

A ladder 20 feet long extends from the foot of one wall in an alleyway to a certain height on a parallel wall. A second ladder, 30 feet long, extends between the walls in the opposite direction. The two ladders cross at a point eight feet above the ground. How wide is the space between the walls? (Answer next month.)



Answer to last month's P.O.T.M.: To free the heart from the wire, first slip the heart around so that it hangs from the bottom of the swing.

Step 1: Hold the bar at the left end (if right-handed) and pick up the heart by its point. Slip the "tongue" through the right-hand loop of the swing.

Step 2: Pull the heart and swing over

to the right end of the bar and, turning the heart so that it's horizontal, slip the tongue around the loop at the end of the bar.

Step 3: Push the heart up and back through the loop at the same time you let the loop drop down. Slight variants of this technique will also work. To replace the heart, just reverse the steps.

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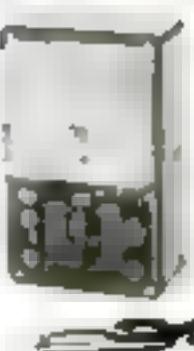
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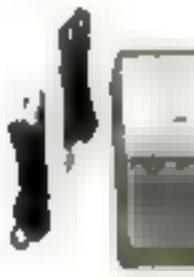
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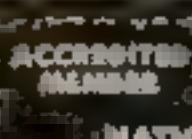
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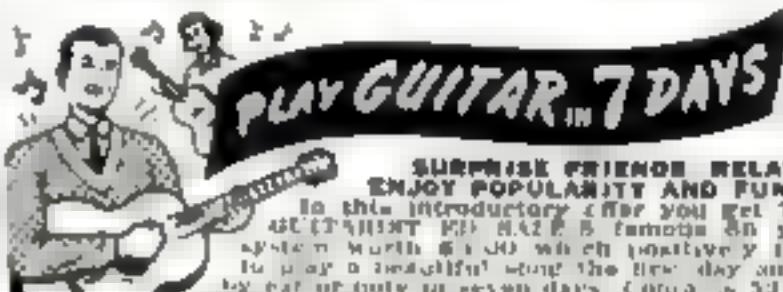
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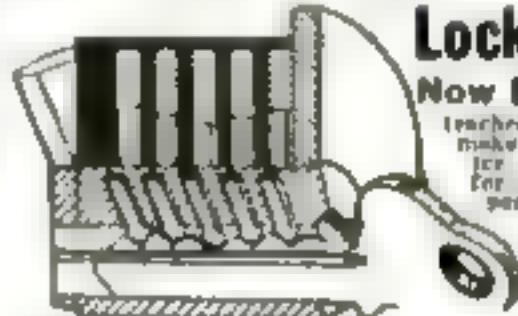
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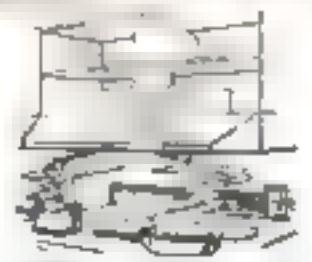
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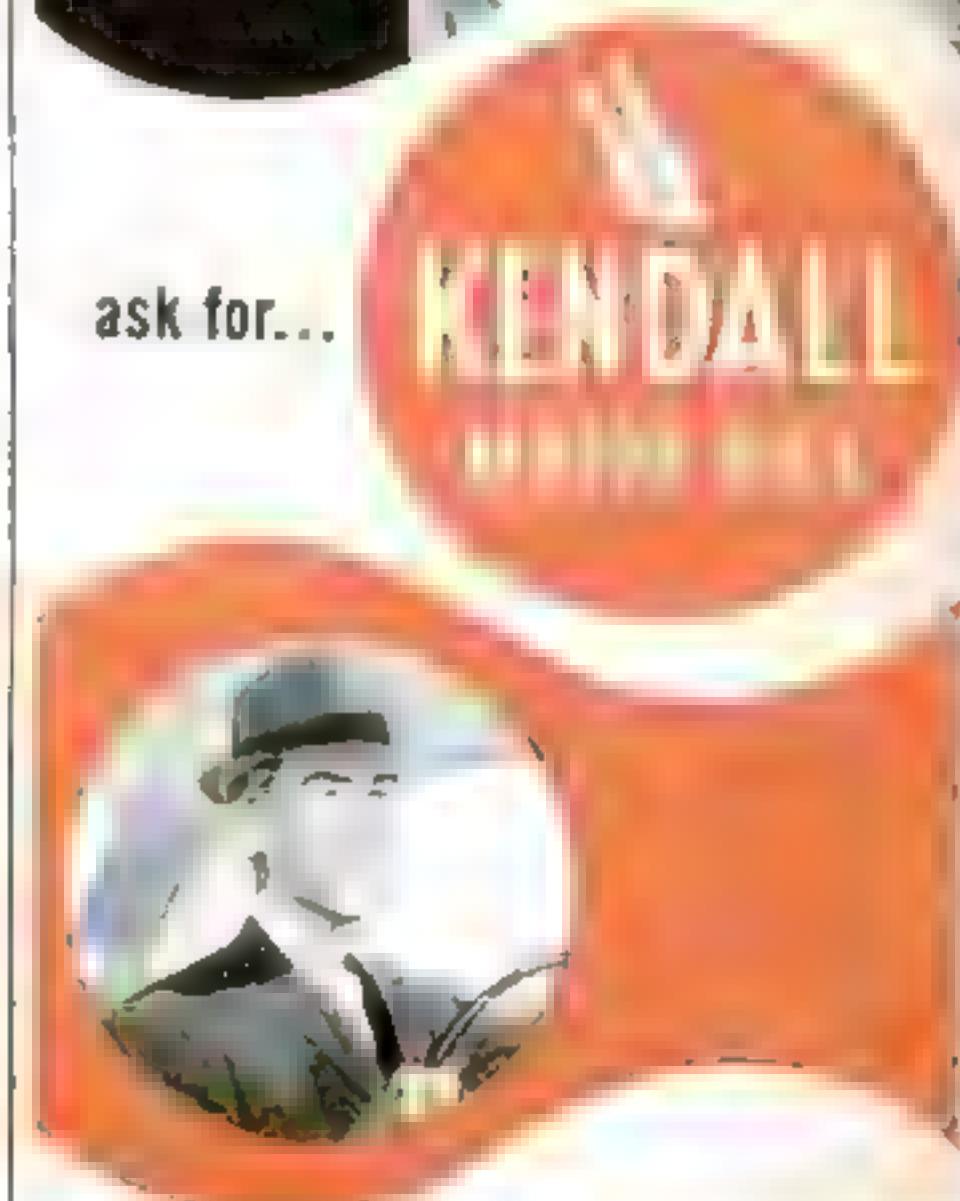
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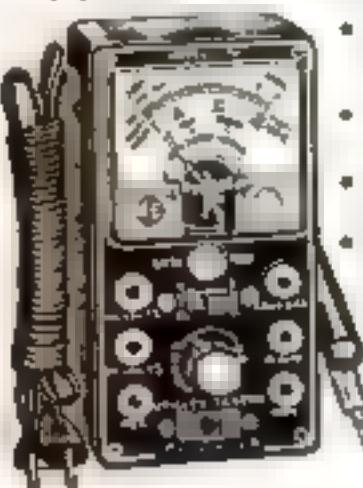
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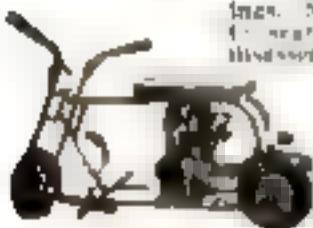
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DETROIT REPORT

By Devon Francis

Small Car, Big Plans

THE inside story of Ford Motor Co.'s strategy in bringing out its VW-size Cardinal reveals a more ambitious goal than anybody had imagined.

Officials at GM and Chrysler Corp. privately insist that most Americans don't want cars any smaller than the current compacts. That explains the so-called senior compacts that are coming out this fall.

But Ford has gone confidently ahead with its program. The low-priced, simply engineered Cardinal is being groomed to

challenge Volkswagen as the No. 1 car in the world market, which has much greater potential for growth than the U.S. market.

Sales will be pushed harder in Europe, South America, Africa, Australia, and Canada than in the U.S. The car will be shipped knocked down to some of these areas; in others it will be manufactured almost completely. Cardinals sold in the U.S. will be partially built in Detroit.

There has been considerable foot-dragging at GM and Chrysler about developing Volkswagen-type cars. Some officials at these companies still don't believe Ford will make the move. Nevertheless, both companies have developed prototype cars, and it's generally believed they could begin producing them a few months after the Cardinal goes into production—if demand were strong enough. American Motors, although sticking with its existing cars, is, like Ford, also moving energetically into the world market.

Wankel engine fires up. A trade source reports that Curtiss-Wright will begin marketing its line of rotating combustion engines early next year with a two-rotor, 70-hp. marine engine.

This will be followed shortly by a three-rotor, 105-hp. unit and a four-rotor, 140-hp. engine. These are also for marine

use. Reportedly, they will weigh about 2.4 pounds per horsepower and will be priced somewhat below present marine power plants.

Industrial and tractor engines will follow the marine units. Contrary to reports, the lubricant for these engines will not be added to the fuel.

Off-on fan. One car maker is developing a new type of liquid cooling system for a small car that would eliminate the large fan and radiator in front of the engine. It would be replaced by a small radiator and an electric-motor-driven fan that would operate only part of the time. It could be located in some out-of-the-way spot.

While admitting that all the cooling-system problems have not been solved, an engineer in the program pointed out that this fan would operate only "on need." Most cooling fans, he said, operate more than necessary—reason for the increased popularity of variable-speed fans, which rotate much more slowly at high vehicle speeds.

Bits and pieces. Volkswageners can now buy a factory-rebuilt engine at savings up to 43 percent of a new one. . . . Although Ford deliberately avoided using an aluminum engine, it is showing considerable interest in aluminum body panels. A good possibility for the future is an aluminum roof. However, aluminum is losing favor in the auto industry. Best example is Buick's coming V-6 cast-iron engine. There is a growing belief that aluminum can do a fine job in certain

applications, but that it's been oversold for some jobs that it's not capable of doing.

A long-range plan now under study by GM envisions much greater interchangeability of components among its five car divisions for engines, transmissions, drive shafts, and differentials. Buick, which has plenty of manufacturing space, might become the "power-train" division, producing engines and other components for all divisions except Chevrolet.

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Let's Get Rolling on Car Safety!

It's time to stop fooling around. Cars can be made safer for you and your wife and children to ride in. They are *not* safe now. You know it. Everybody knows it. Now it is time to do something about it.

For years designers have known what to do. Engineers know the specific changes—many of them cheap and simple—that could save thousands of people from death or disfigurement. These changes have been studied, developed—and ignored. The buck has been passed . . . and passed . . . and passed.

The death toll continues to climb. Last year in the U. S., cars killed 38,200 people. (In a decade they have killed an incredible 375,000 men, women, and children.) And nobody really knows how many are seriously injured each year. The best guess: 1,400,000.

Conservatively, this number could be cut a third to a half by simple changes we already know would work.

This month, in the first of a series of articles, Popular Science lays bare the public apathy and special interests that have made needless deaths a national tragedy. The blame is not simple. The remedy is obvious: Federal laws either to permit the auto industry to police itself on safety standards or actually to prescribe those standards.

*Turn the page for the revealing inside story:
"Why They Don't Make Cars Safe"*



1962
GM
Lark



This is a 150-m.p.h. collision at Daytona Speedway last spring. Man inside crumpling

Why They Don't Make Cars Safe

Everybody deplores the slaughter on our highways.

Everybody knows how to prevent it. Yet nobody does.

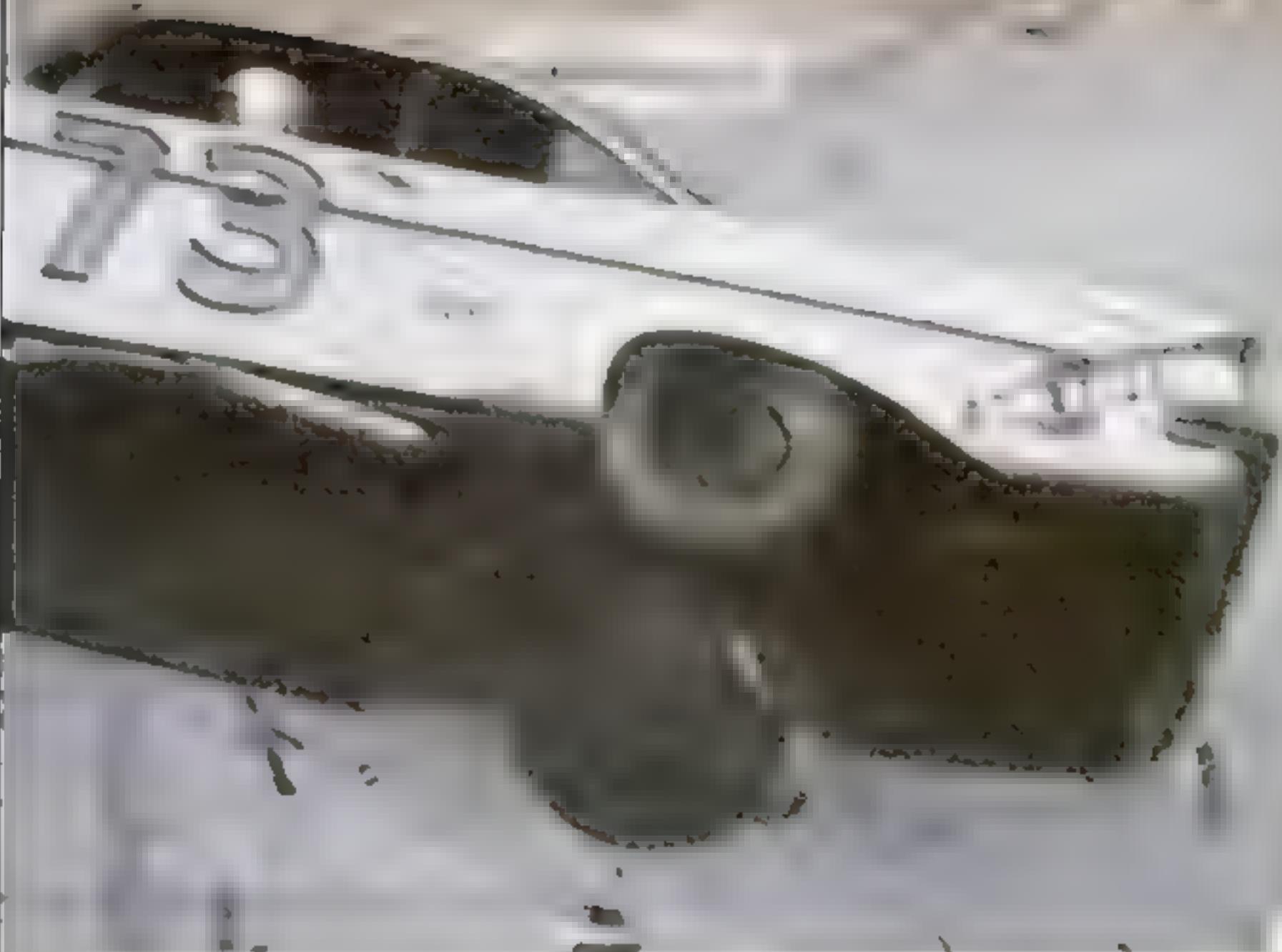
Here is the painful truth about a national disgrace

By Martin Mann

LAST winter, to the sound of trumpets, Detroit issued a big announcement: The '62 models will be equipped—at no extra cost—with anchorages for seat

belts. "Anchorages" means four extra holes in the floor. Front seat only (except on Lark). No belts—these you buy extra.

Can four holes in the floor save one single life? Or is it like fitting out ocean



pile at left, barely recognizable as a car, broke a leg. Driver of No. 73 walked away.

liners with davits, but expecting the passengers to come aboard carrying their own lifeboats?

Maybe you can't blame people for hailing this as a great advance in auto safety. But that so much is made of so little reveals how unreal the situation is.

Modern cars are more convenient and

What's Detroit's side of the story?

NEXT MONTH Auto makers answer back. The industry's own experts reveal the inside story of what can and cannot be done to make cars safe.

COMING SOON . . . Popular Science reviews the brand new 1962 models. How safe—or dangerous—are they? You'll get a frank critique from Paul Kearney, nationally known authority on auto safety.

attractive than ever. They are also safer. But they are not nearly safe enough. Worse, they are not as safe as we know how to make them!

Whose fault is it? Everybody's. The driving public insists on thinking that accidents happen to somebody else. Safety gets no more than lip service. Perhaps most guilt stains the Government, which has known how to cut the death toll but hasn't—so far—chosen to act. After all, those lifeboats don't hang from ocean-liner davits because of shipowners'

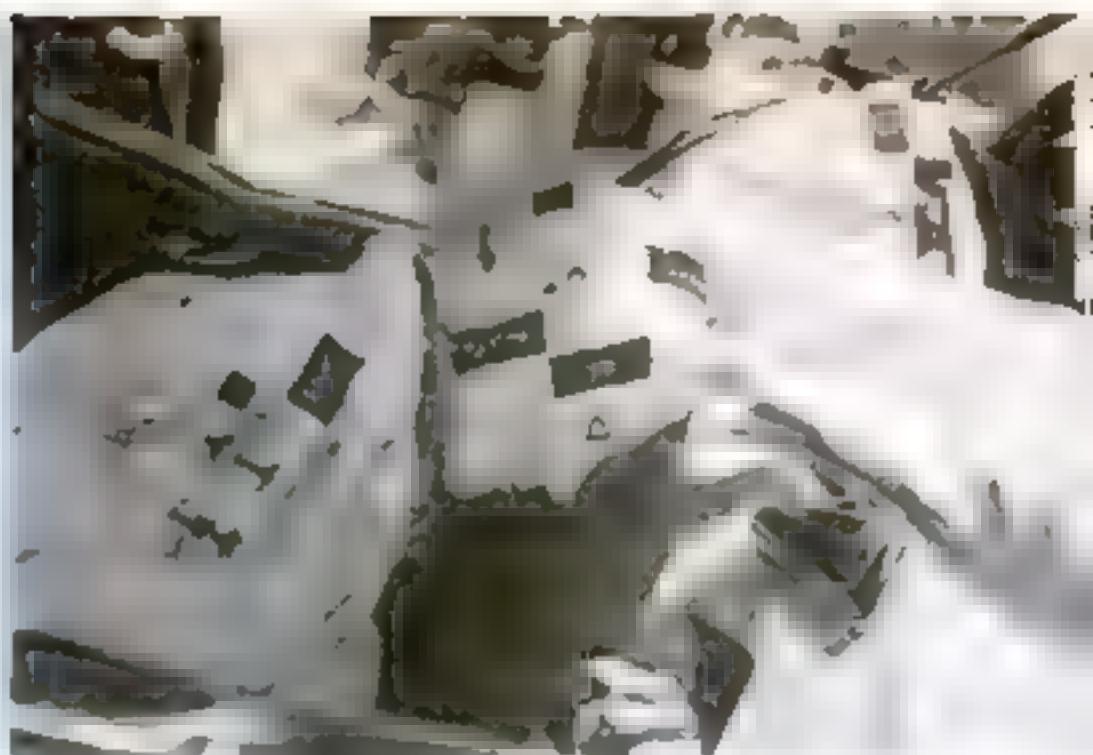
CONTINUED

WHY THE RACING DRIVERS CAME THROUGH: Their cars—stock '61s—had been made safe with harness, roll-over cage, locked-shut doors.



Staged crashes point to changes that can save lives

Precisely managed head-on collisions at UCLA's Institute of Transportation and Traffic Engineering convict murderous auto designs. Just a little ash tray "killed" dummy (near photo), even though seat belt held in 45-m.p.h. crash. Steering unit is another killer because it is anchored to car frame, slams back at driver. It broke neck of dummy in center photo and was equally lethal to dummy driver at far right, shearing off nose and tearing chest.



benevolence; Federal law requires that they be there and specifies every detail of their construction down to the screws.

"The only way to solve the traffic-safety problem," concludes Dr. Daniel P. Moynihan of Syracuse University, "is to establish a Federal automotive agency that will develop and then prescribe safe designs for automobiles."

Maybe so. Alternatively, the auto industry might be given an opportunity to set up and police its own safety code under an exemption from the antitrust laws.

The big boondoggle

Uncountable millions of dollars have been spent in the name of automotive safety. Propaganda agencies beg you to go slow and scare you with morbid predictions. Universities pursue the scientific method: Cornell collects statistics, Harvard probes in depth, UCLA and Minnesota smash cars. The auto industry tries all approaches. The cops write

tickets—and radio for ambulances to haul away the bodies.

This vast effort is uncoordinated and timid. Some of it is plain boondoggle. Yet it has proved many useful facts (if anyone will use them):

- Propaganda accomplishes little or nothing. Every year the safety posters get bigger—and more people get hurt, even though accidents-per-mile driven have gone down.

- Safety can be furthered by many different actions—sensible policing, stricter licensing, better roads, more intensive education.

- But the fastest way to get results is to redesign the car.

If you could just keep car doors from flying open in crashes, you would save 5,500 lives every year. That's been known since 1958.

Improvements in the car take effect quickly. A change made in 1962 will be in half the cars on the road within seven years. Remaking the highway system—a

The 10 steps that will make cars safe

These additions immediately (they are options now):

1. Seat belts
2. Padding on dash panel and windshield frame
3. Outside mirror

These additions as soon as designs can be changed:

4. Collapsible steering mechanism
5. Headrests
6. Recessed knobs and handles
7. Stronger roof framing

These improvements as fast as they can be checked out

8. Clear view of the road—standardized windshields that don't reflect dash panel; effective windshield wipers, washers, and defrosters, redesigned mirror system for rear vision
9. Better lighting—brighter, nonglaring headlamps; high-visibility tail lights; unmistakable stop and turn signals
10. Responsive control—more precise handling; quicker, surer braking



favorite safety proposal—would take generations.

Improvements in the car benefit everyone—young and old, driver and passenger, skillful and clumsy, on every road. No other safety strategy does.

But the clinching argument for crash-proofing the car is absolute necessity: Accidents are inevitable. The figures show that at least one-fourth of all cars will be involved in accidents that hurt or kill people.

It can be done—now

POPULAR SCIENCE asked safety experts from government, industry, and the universities these direct questions:

Can reasonable standards of design for crashproofing cars be set?

They said: "Yes."

Would it take long?

They said: "A year or 18 months."

Would safe cars cost more?

They said: "Yes. But \$100 would cover the important items."

Would it be worthwhile? How much could deaths and injuries be reduced this way?

They said: "A great deal—a third or more." Prof. James Ryan of Minnesota said: "Fifty percent."

These men are not spouting opinions off the cuff. They have the facts.

Back in 1954—that's seven years ago—Cornell's Automotive Crash Injury Research proved that an automobile is a strong suit of armor. UCLA's crash tests confirm this. The awesome impact of a 30-mile-an-hour head-on collision—100 Gs, 100 times the force of gravity—is largely absorbed by the crumpling metal of the

car. The driver gets only 30 Gs. But he has to keep his armor around him.

How to do it

Seat belts strap the armor on. Seat belts work. A meticulous comparison of 9,000 people involved in accidents in California showed that belts reduced bad injuries by one-third.

Door locks should hold that armor around you. Better door locks work. The new types introduced in 1956 have reduced accidental openings by a third, and associated injuries by 11 percent. But recent studies reveal that some of the new locks are much better than others. Today's best door lock reduces accidental openings by only half. Surely American engineering talent can do better than this.

And the armor can be beefed up. A roll-over cage—a steel framework surrounding the passengers—would be much safer than flimsy roof supports.

Yet a sad fact remains: The armor itself hurts people in car crashes—unnecessarily. They are smashed by the steering assembly, battered by dash panel and seat backs, impaled by knobs and handles. We know these facts scientifically—and continue to make, license, and buy cars containing known instruments of death and disfigurement.

The steering assembly was convicted years ago as a deadly murderer. It still crushes people, accounting for more "moderate-to-fatal" injuries (eight percent) than any other single cause. The dished steering wheel, introduced with such fanfare six years ago, hasn't solved the problem. It helps only a little. Col-

They knew how to make 'em safe



"SAFETY INTERIOR!" Instrument panel controls are recessed... Nothing to bump or tear." That was what the ads said about the DeSoto way back in 1937. And the ads were right. Recessing knobs and handles is foolproof, low-cost protection against many injuries. Experts have urged for decades that all cars be made this way.

...but that was 24 years ago. Look what's happened now



SHARP HORN ORNAMENT is criticized as dangerous. When wheel spokes bend down in crash, raised edges on button may cut driver's chest.



HOOD OVER GLOVE BOX looks pretty, but its thin edge is considered a hazard to passenger. Most dashes are smoothly rounded. Why not all?

lapsible or heavily padded units would help a lot. Several designs are available.

The instrument panel is lethal (four percent moderate-to-fatal injuries). But on most cars padding has been optional—at extra cost. Why isn't it standard on all? Can elementary safety be an optional extra? In airliners, coach passengers get the same safety equipment that first-class fares do.

Why are the backs of the front seats so often unpadded? This is the source of five percent of those moderate-to-fatal injuries. Why is it legal to install ash trays at the precise spot where skulls are known to strike?

Headrests can prevent whiplash from snapping your neck. With the rear-end collision on the rise, why are headrests an extra-price option on only a very few cars?

[Continued on page 208]



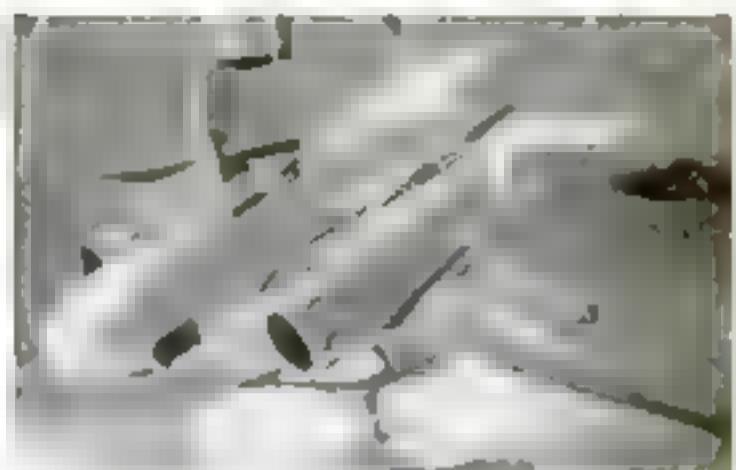
UNDERSIDE OF DASH is too low, experts claim. If passenger is hurled forward, knees may rise, hit dash, forcing leg bone back to break hip.



CONTROL KNOBS are located where they might stab knee or head of passenger. Most controls—but not all—are now placed behind wheel.



SUSPENDED FAR BELOW GONDOLA, model Navy plane goes through "wind-tunnel" test with help from a big ZPG-2 dirigible. It hangs at end of 33-foot strut that's hydraulically retractable through bomb-bay door.

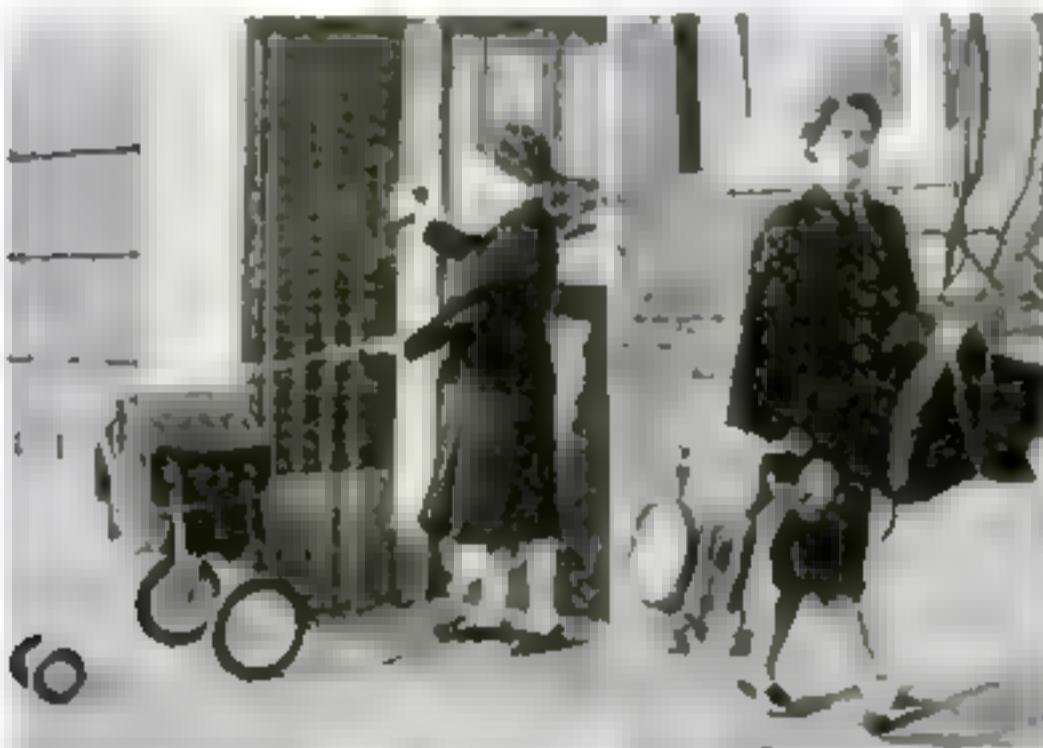


MOUNTED UPSIDE DOWN by means of slot in bottom of fuselage, 10-foot model of Navy S2F has its vertical stabilizer away from strut's slip stream.

Blimp serves as flying wind tunnel

Although the Navy has scuttled its dirigible program, one airship has been granted a reprieve at Lakehurst, N. J. It will be used as a low-speed flying wind tunnel. Suspended from the 343-foot ZPG-2 on a hydraulically retractable

strut, large models of new planes can be tested for control and stability at speeds from zero to 85 m.p.h., and at altitudes from near sea level to 5,000 feet. It is particularly suited for testing models of planes for short takeoff and landing.



Cart takes weight off shoulder...folds for easy carrying.

Collapsible cart for mailbags

Because mail sacks are heavy when loaded, the postwomen in Amsterdam, Holland, have been supplied with collapsible carts. The wheels take the weight when mail is being delivered. The carts can be folded compactly for carrying back to the post office when sacks are empty.



Boarding-house reach

Tough but light tubular steel was used for a 170-foot boom to extend the arm of the crawler crane above. With a 40-foot jib on the end, it has a radius of more than 200 feet, can reach nearly 25 stories in the air. It was designed jointly by Bucyrus-Erie Co. and Babcock & Wilcox.



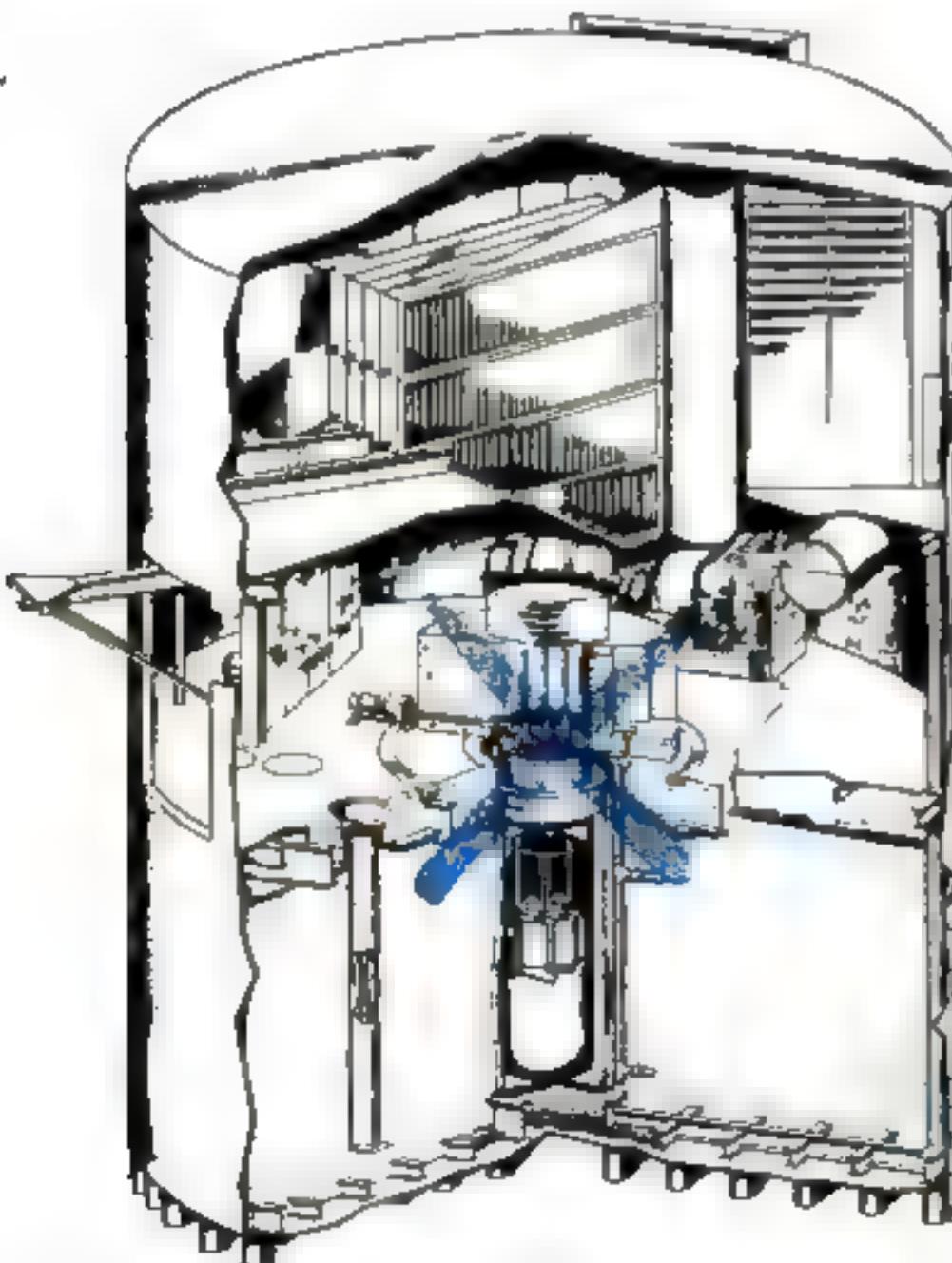
Half-tread tires for big race

Tread on the outside, bald inside. That's how Dunlop made special tires for the Cooper racing car driven by Jack Brabham of Australia in the Indianapolis 500. The tires, designed for maximum speed and traction, were mounted with the treaded half on the right side to provide grip on the all-left-hand curves. The bald section extended tire life when running on the abrasive surface of straightaways. Brabham finished ninth.

The Atomic Accident That Couldn't Happen

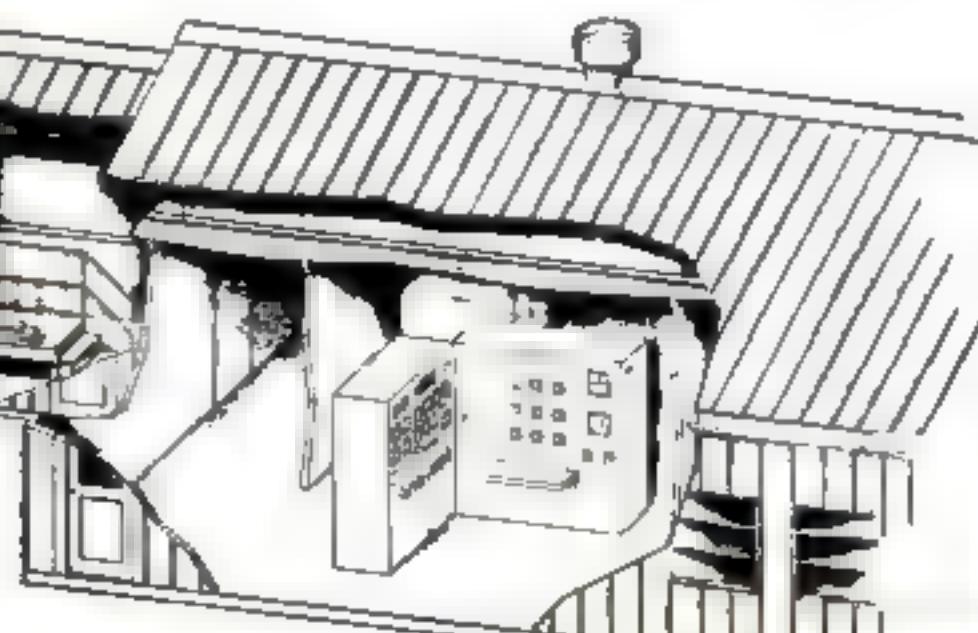
*How scientific sleuths solved
the baffling mystery of America's
first fatal reactor explosion*

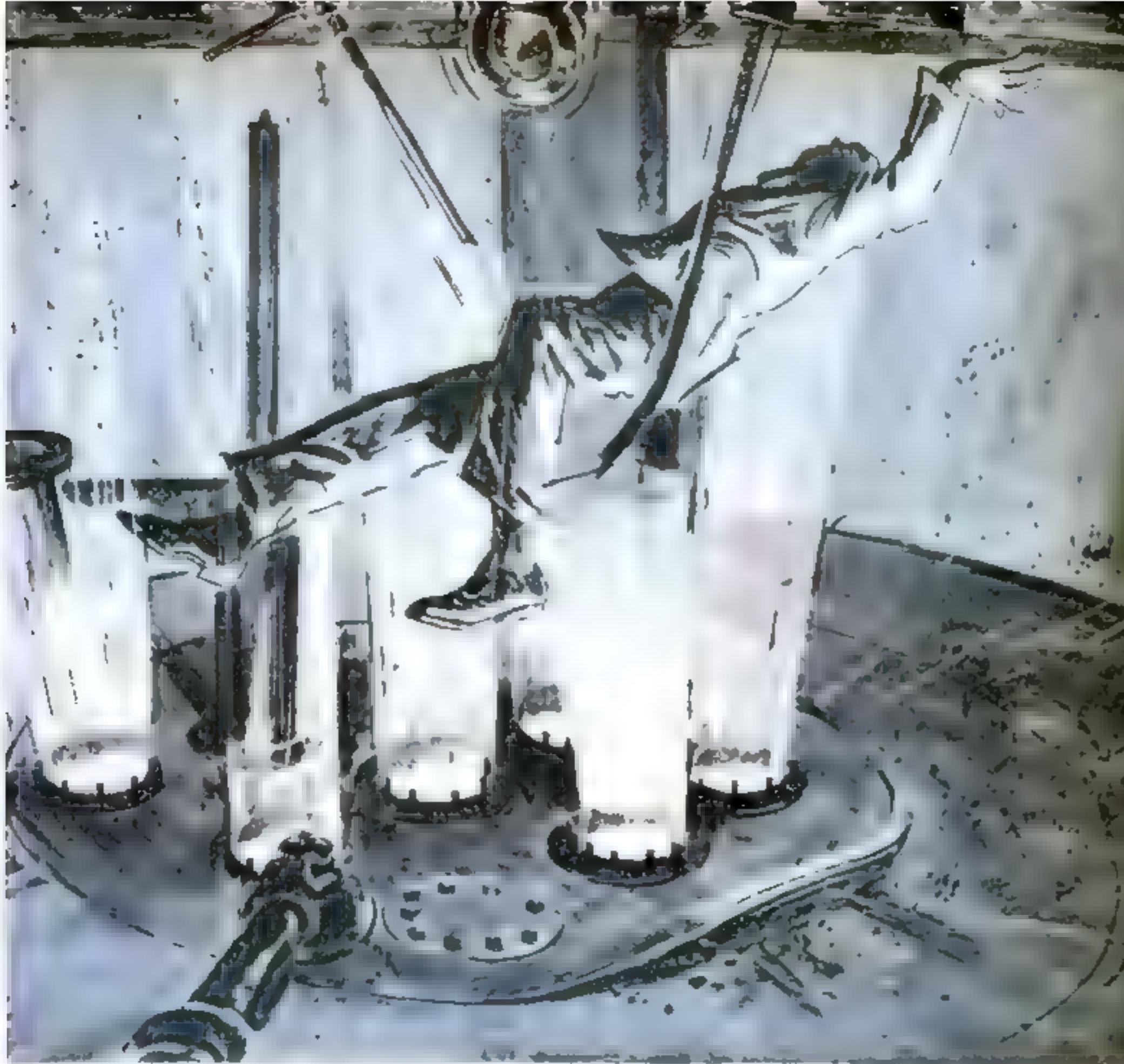
By Alden P. Armagnac



X marks the spot

... where blast from top of SL-1 reactor killed its crew of three. Men were in circular reactor room at mid-height of tanklike Reactor Building. Entrance to room was from Support Facilities Building, below, by way of short passage and an enclosed stairway, not shown, ascending the outside of the Reactor Building





A BLUE flash lit up the circular room. There was an explosive concussion. From an atomic reactor gone berserk, metal pieces whizzed through the air. Death came to two men, and a third was mortally injured.

That happened last January 3 at the National Reactor Testing Station, a 900-square-mile expanse of sagebrush-covered Idaho desert. The immediate scene was the 350-foot-square test site of Stationary Low-Power Reactor No. 1—a modest-size prototype of military A-power plants to furnish electricity and heat for remote Arctic radar outposts.

It was our first fatal reactor accident—and the more stunning because this reactor was considered accidentproof.

Did an unknown peril threaten the country's ambitious plans to harness nuclear power? Within 24 hours the Atomic Energy Commission launched a full-scale investigation. Now the report is in.

This is the story of what eyewitnesses saw—and how the A-sleuths pieced together the clues to the mystery blast.

At four p.m. on Tuesday, Jan. 3, three young military men came on duty at the "SL-1" plant. They would be alone in it until midnight. All in their twenties, all qualified to operate the reactor, they were John A. Byrnes, Army specialist fifth class; Richard L. McKinley, Army specialist fourth class; and Richard C. Legg, Navy construction electrician first class. Just what they had to do was im-

After the mystery blast came heroic rescue efforts—



EARLY PHOTO following explosion peers between concrete blocks at wrenched top of reactor. On floor are spewed-out steel turnings and gravel, which served as shielding.



MASKED MAN with meter surveys radiation near Reactor Building, behind him, on day after accident. A small "radioactive plume" that drifted downwind was traced, found harmless.

portant, because it led to the accident.

The reactor had been shut down—for one thing, to insert power-measuring wires through ports in its top. To open the ports, Tuesday's early-morning crew had disassembled the driving gear of the control rods. The daytime, eight-to-four shift had put in the wires. Now Byrnes, McKinley, and Legg were to reassemble the control-rod drives, so that the reactor could start up again next day.

In the reactor-room ceiling above the busy crew was an automatic trouble-detecting device, wired into the NRTS alarm system. A fire, an explosion, or escaping radioactivity would set it off.

At 9:01 p.m. the alarm sounded eerily in NRTS' fire and security headquarters. Six AEC firemen, an assistant fire chief, and a security patrolman raced the eight miles to the scene in a fire truck and two cars. They got there at 9:10. Donning breathing masks, carrying radiation meters, they entered the gate.

Beyond two nearer structures loomed the tanklike Reactor Building, a windowless steel cylinder 48 feet tall—gaunt, still, outwardly unharmed.

Toward it the firemen tramped, through the Administration Building and then

the Support Facilities Building, which housed the reactor's remote-control room. No fire, no smoke, no one there.

From the support building, a short passage led to the foot of an enclosed stairway which ascended the outside of the Reactor Building to its reactor room. In the passage the firemen stopped, as excessive radioactivity kicked over their meter needles.

Reinforcements appeared—health physicists from the Materials Testing Reactor site, 11 miles away, which Phillips Petroleum Company operates for the AEC. Two who arrived at 9:36, already in protective coveralls, reached the top of the stairs and the reactor-room door.

Deadly radiation. There their meter's needle swung to its top reading—500 roentgens an hour, enough r's to kill an average man in an hour's exposure. Inside it would be even "hotter." They peeked in, saw no one, hastily retreated.

Over NRTS' radio network went the grim announcement: "Class I Disaster."

What had happened to the SL-1 crew? A check by radio dashed hope they might be at another site. The three men must be inside the Reactor Building.

More help was on the way—but it had

then sifting of clues

farther to come. No one lives at NRTS; its daytime people were home. Most of them were in Idaho Falls, 41 miles away. So were the AEC's Idaho Operations Office; and the SL-1 headquarters of Combustion Engineering, Inc., which operated the reactor for the AEC and the Army. Raising key men there took 35 minutes. In cars barreling over U. S. Highway 20, they were speeding to the scene.

Time was running out. If anyone was still alive in that hellhole of radioactivity, his exposure to radiation was rapidly nearing a fatal dose. But were there any survivors? Might a rescue attempt only swell the casualties? If the reactor had run away, it might now be hair-triggered-ready, at a slight jar, to lash out again.

The dilemma ended with the arrival of four Combustion Engineering men. Quickly they weighed the appalling risk, the slim chance of saving anyone, and made a heroic decision: They were going in.

At 10:35, CE's supervisor for plant operations and its health physicist entered the reactor room. Within two minutes they returned. They had seen two men. One was moving.

Race against death. All four CE men and an AEC health physicist now braved the room's perils. Working with desperate speed, in three minutes they put the living man on a stretcher, saw the other was dead, and were downstairs with their human burden. An ambulance took the rescued man to Highway 20. Meeting it there, an AEC doctor found the man dead—of a head wound he could not possibly have survived.

At 10:48 another heroic party, of two military men and two from Phillips, went in and saw the lifeless body of the third man—lodged in the ceiling.

The second body was recovered Wednesday evening; the third, the following Monday. Unabated, the radioactivity near the reactor proved as high as 1,000 r's an hour. But advance planning reduced exposures. Timed with a stopwatch, two well-rehearsed servicemen picked up the second body and were out, before their allotted 60 seconds was up.

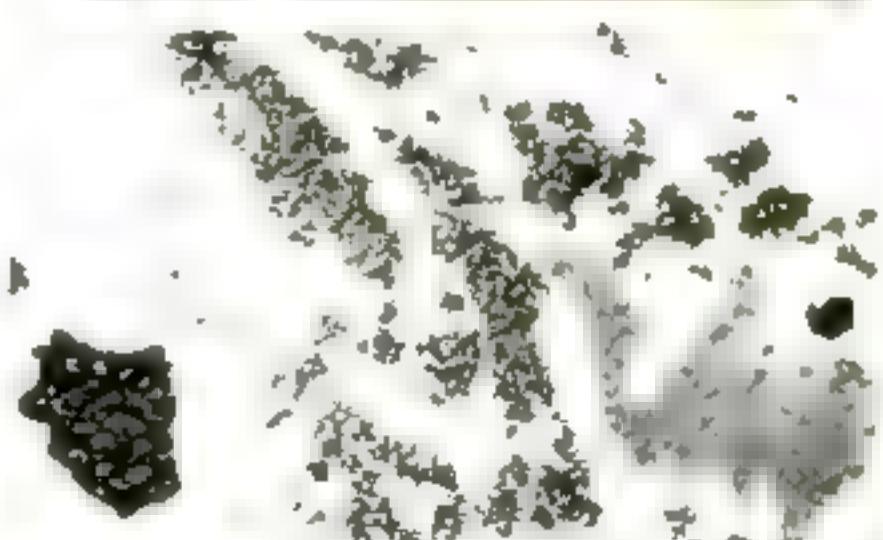
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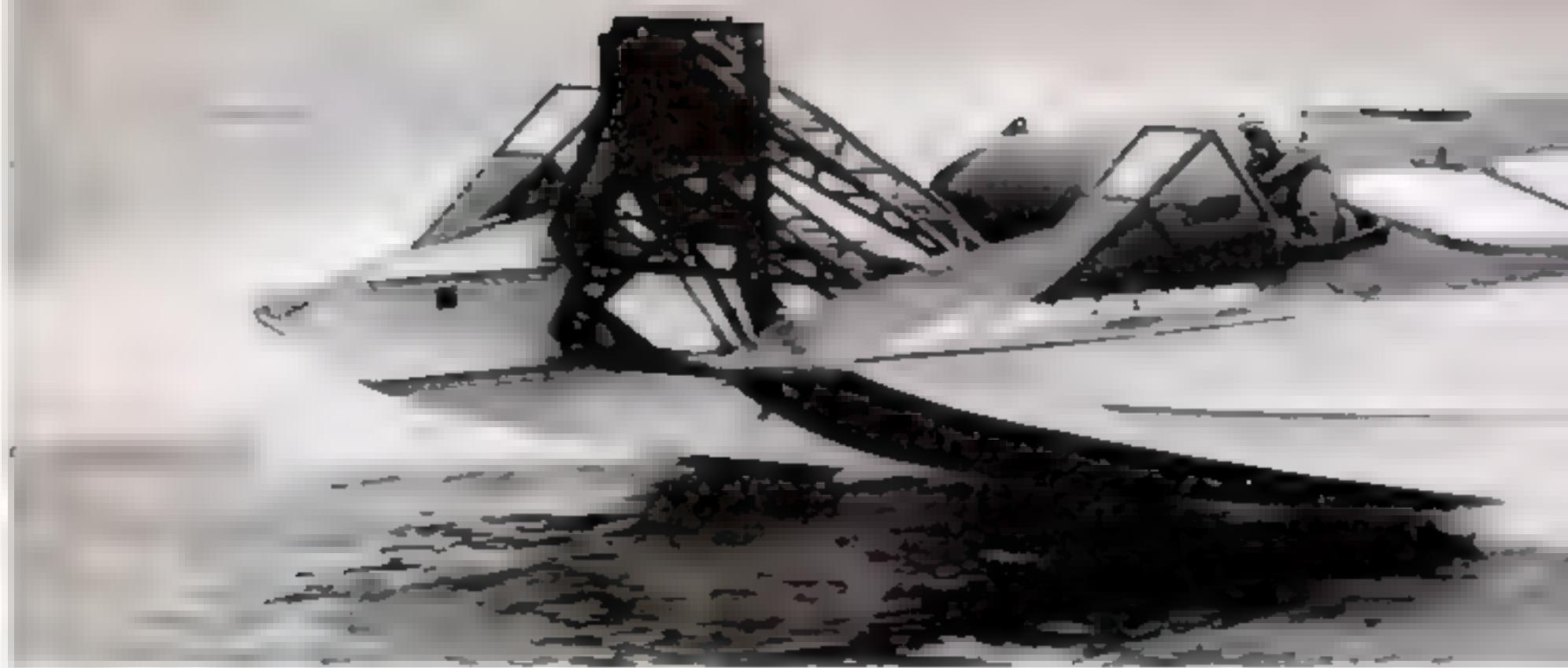
RUNAWAY-PROOF when control rods were connected to their motor drives, as pictured here, SL-1 reactor was found by probbers to lack a needed safeguard when they were disconnected.



LOOKING DOWN INTO SL-1, preaccident view of core shows the cross-shaped housings in which the wide-finned, close-fitting control rods slid up and down. Sometimes they stuck.



FALLING APART, the SL-1 for months had been shedding pieces of its boron "poison" strips, needed to keep it under control. Seven-inch-long fragment (upper view) and smaller ones (lower view) were among those fished from bottom of water around core before the accident.



Jet-Powered Hydro

A JET engine that powered the old Air Force Shooting Star now hurls a giant hydroplane over the surface of Seattle's Lake Washington. Although designed for speeds of more than 100 knots, Boeing's new Aqua-Jet isn't a marine hot rod—it's a floating test lab. The bow is forked to provide a recess in which

models of experimental hull designs are suspended. While the propellerless hydro pushes the model through the water, a technician, riding alongside, checks design performance by means of instruments and direct observation.

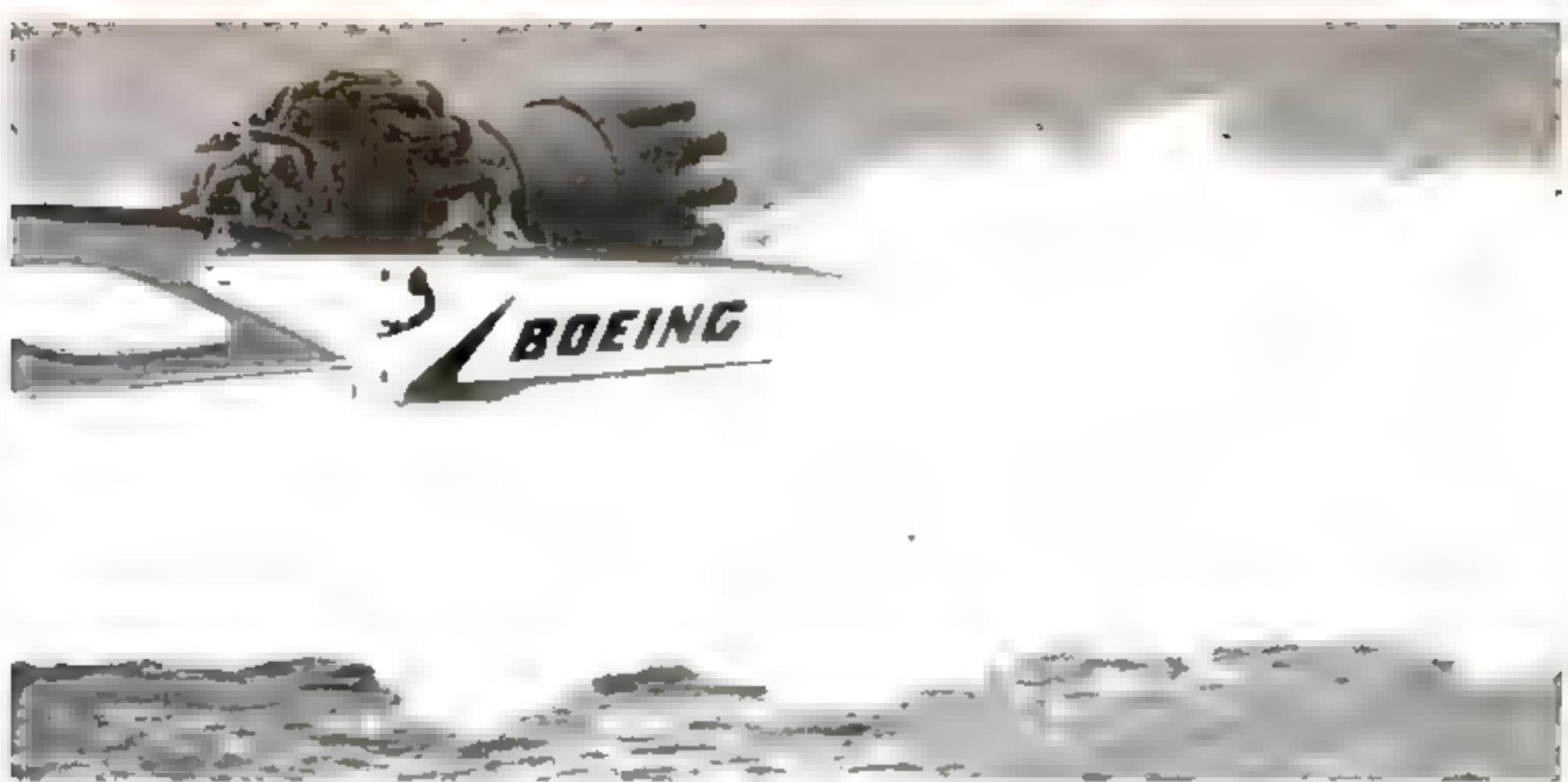
This type of in-action research supplements the conventional tow-tank



LOBSTER-SHAPED HULL is formed of 9- and 11-ply African mahogany. Two externally mounted steel fuel tanks (faired into body behind jaws) hold 165 gallons of 80-octane gasoline.



DRIVER'S COCKPIT is in starboard prow. Snug-fitting seat has padded flanges that bracket thighs to prevent bounce-out. Observer in port cockpit studies the model's performance.



Tests Model Hulls

method of testing. Together, the two techniques are to hydrodynamics what the wind tunnel is to aerodynamics. The 11,600-pound, \$25,000 Aqua-Jet is intended for straight-line, one-minute runs of $1\frac{3}{4}$ to $2\frac{1}{2}$ miles. The engine, mounted above the water line, operates exactly as it would in an aircraft.



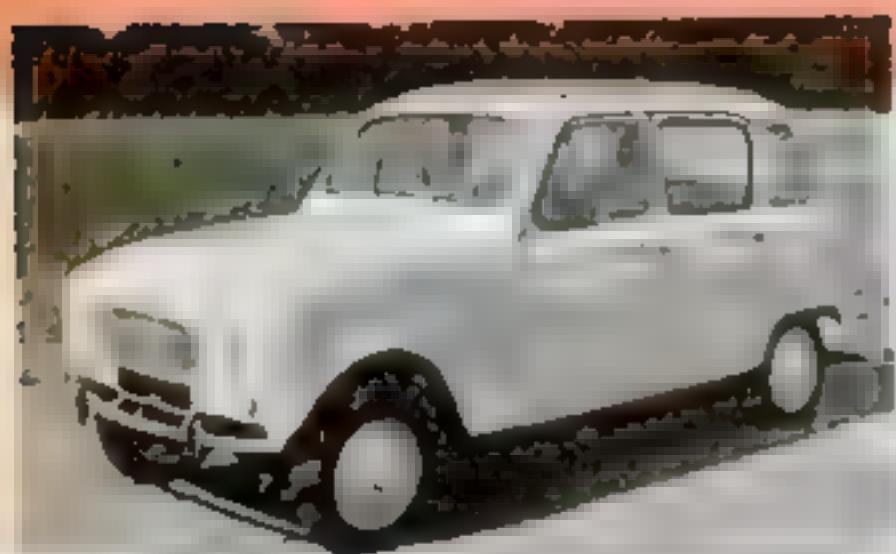
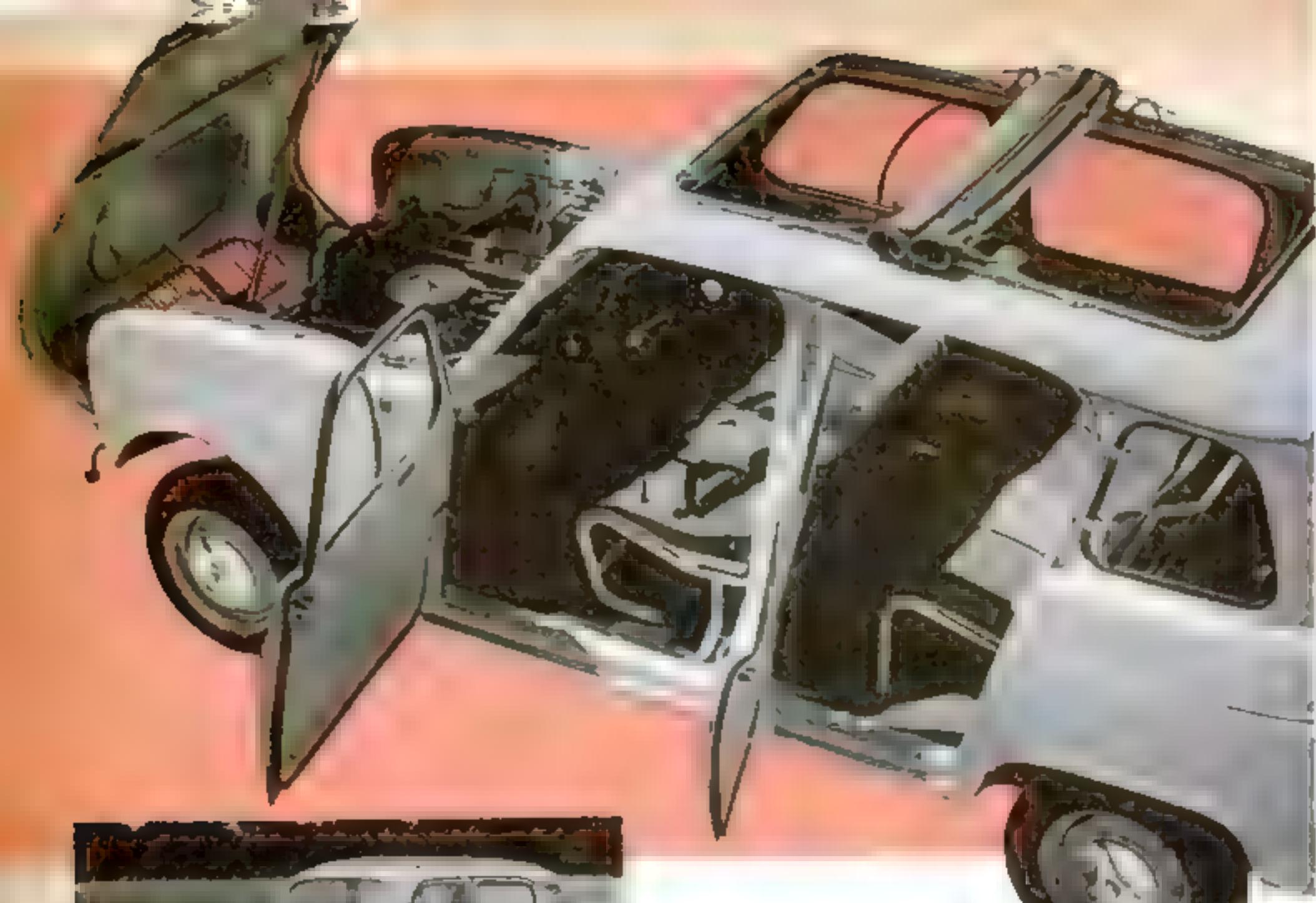
COUPLING ARM, attached to cable-controlled actuator, keeps twin rudders parallel. Aluminum wedges at rudder corners act as skis to dampen fishtailing and provide planing points



MIGHTY THRUST—4,600 pounds—is supplied by Allison J-33 pure-jet engine, silenced by sound suppressors developed for 707 transports. At 100 knots, output equals about 1,400 hp.



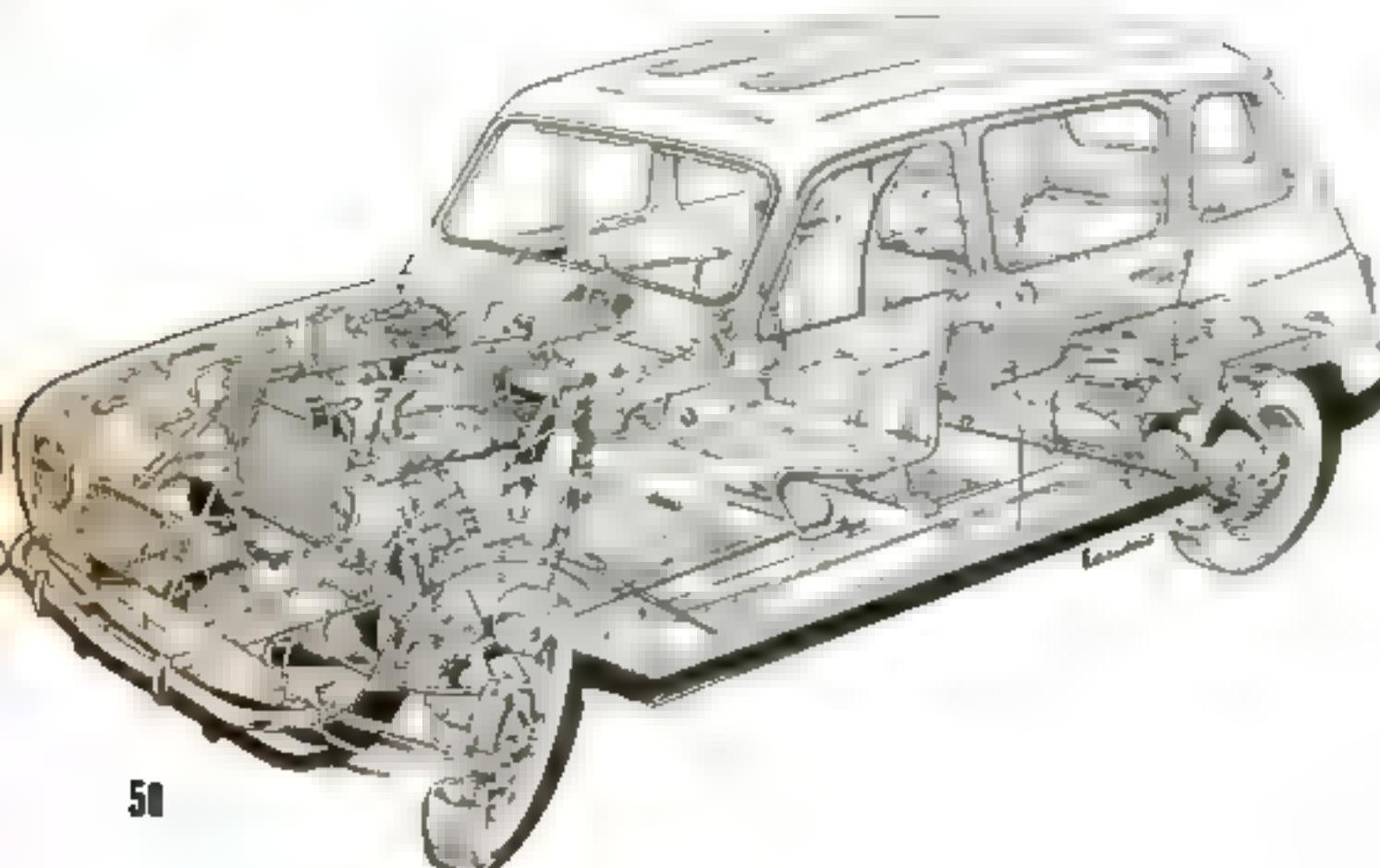
ALUMINUM SKIN on underside of twin forward hulls assures sleek, durable surface. The Aqua-Jet, a three-point hydroplane, has an overall length of 38 feet and a 17-foot beam.



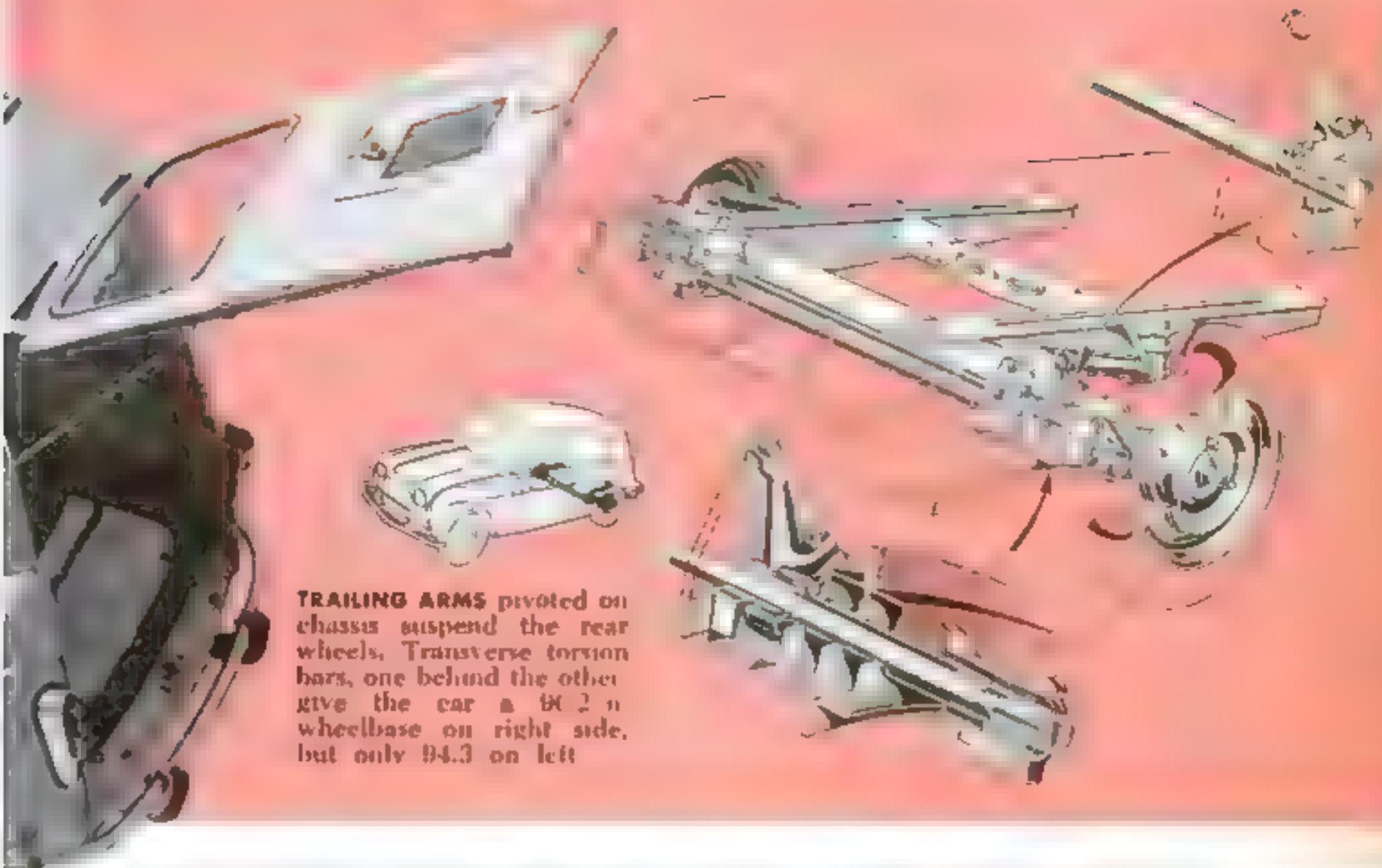
IT OPENS WIDE! There's no lack of access to the interior of the new little Renault, as you can see at top of page. Rear seat removes easily, converting car into a cargo carrier.

The Car You Can't Grease

By R. P. Stevenson



FRONT-DRIVE gearbox is just ahead of the front axle, the four-cylinder, 26.5-hp. engine just behind. The R4L model shown here is 143.9 in. long, 58.5 in. wide, and just a shade over 5 feet high. It weighs 1,200 pounds. All wheels are sprung independently, with long torsion bars and shocks. Muffler is under left front fender.



TRAILING ARMS pivoted on chassis suspend the rear wheels. Transverse torsion bars, one behind the other give the car a 90.2 in wheelbase on right side, but only 94.3 on left

Lube points? You won't find any on Renault's new front-drive model. And the sealed radiator contains a year-round coolant

A SEALED cooling system is one of two surprises you find in the new Renault. A complete lack of grease points is the second.

The car itself is a rugged but handsome little front-driver that will now replace the 4CV, the famous "Quatre Chevaux" that this French factory has

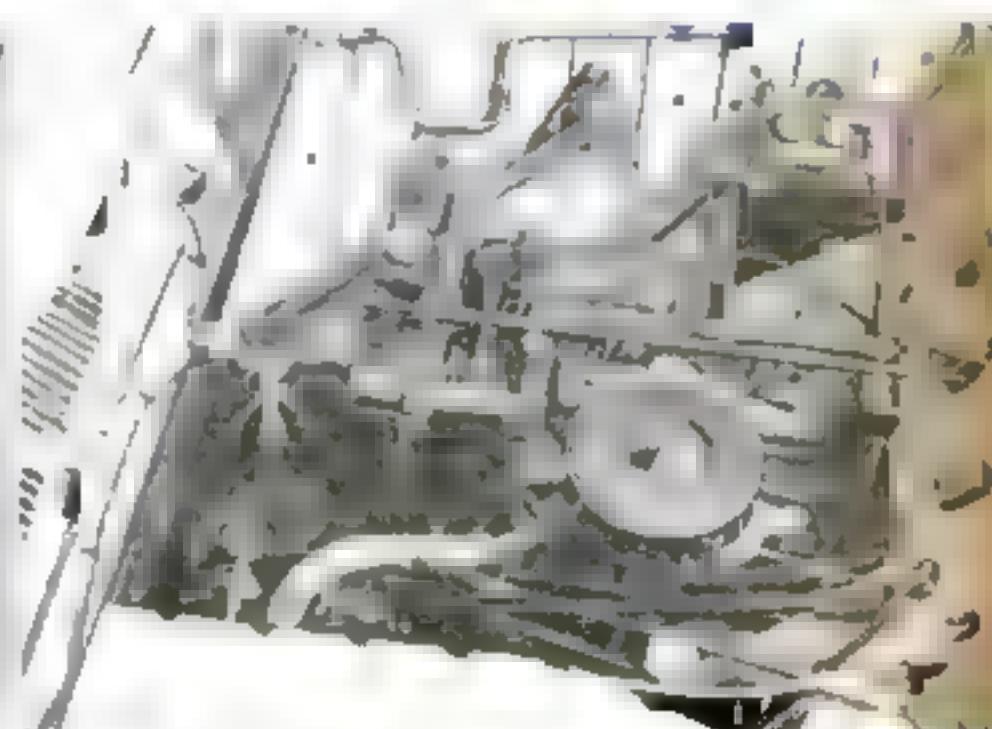
been turning out to the tune of many thousands each year since 1947.

In designing the car, the engineers had two objectives. First, they wanted a model with good styling and brisk performance that would still be economical to buy and operate. Second,

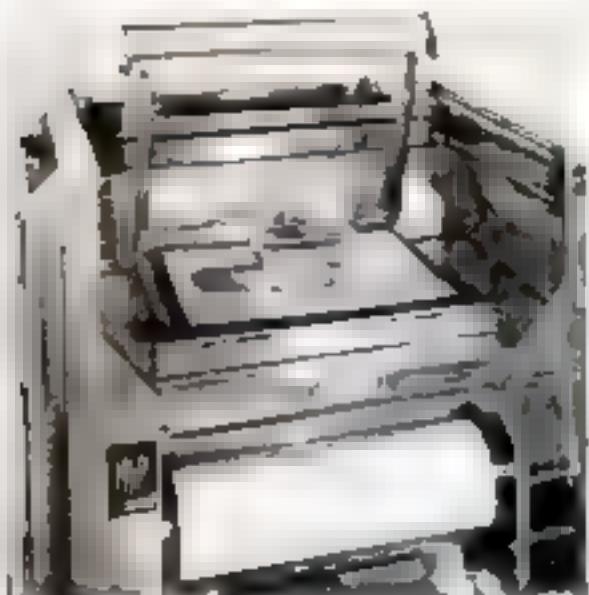
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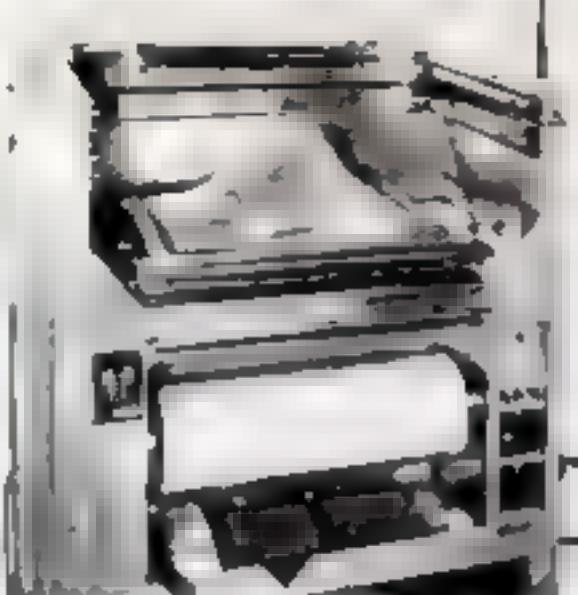
GEAR-SHIFT LEVER is placed at middle of dashboard to operate the control rod running forward above engine and down to the gearbox.



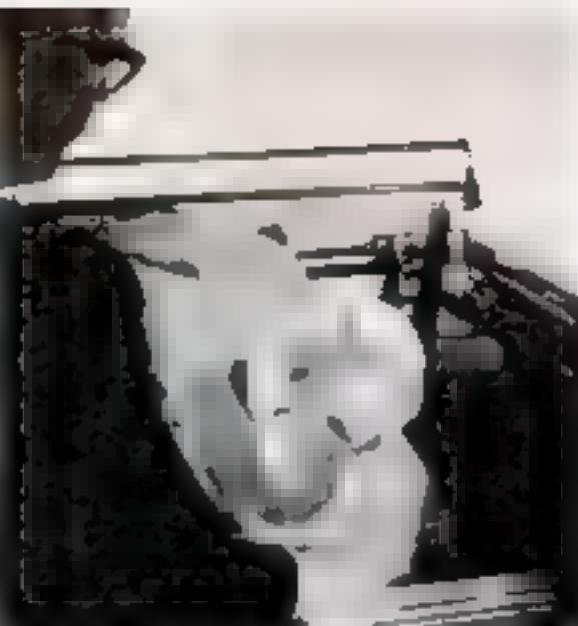
ENGINE in both Renault R4 and R4L is modified version of the one used in 4CV and the Dauphine. Electrical system is six-volt.



1. GOLDFISH IN BOWL are set in center of backing sheet. Plastic film, on roll below, runs up into frame shown here raised behind the bowl.



2. FRAME IS PULLED DOWN, covering bowl with plastic film. Heating platen is pulled out on tracks at sides to seal the film around bowl and backing.



3. FINISHED PACKAGE can be tilted without spilling either water or goldfish. Vacuum-seal method is used in packaging many small objects.

How to pack goldfish in their bowl

The next time you move, forget the china barrels, boxes, and newspaper stuffing. There's a machine that will do the work cheaply and efficiently, and leave less mess to be thrown away.

Using polyethylene film on a backing of corrugated cardboard, it vacuum-packs anything from dishes, bric-a-brac, glassware, tools, shoes, condiments, and drugs

to radios, and even goldfish in their bowl. Poly-Tite works on household current, unwinds plastic film from a roll, stretches it over the object to be packed, and heat-seals the film tightly in place.

Mounted on dollies, it can be taken to a home in the moving van and operated by one man. It's made by MfP Co. (Machines for Packaging), San Mateo, Calif.



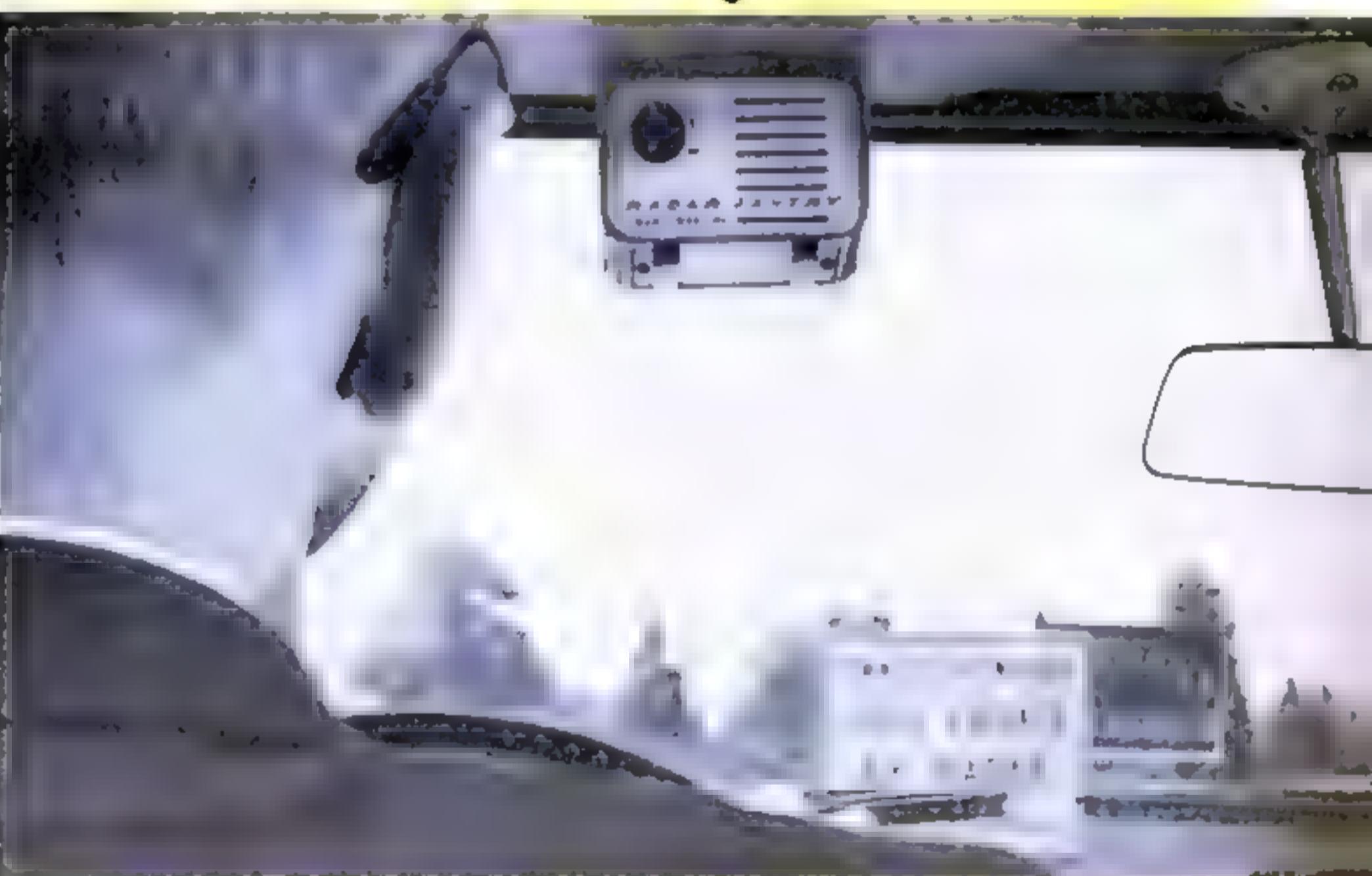
New interior for Volkswagen "camp on wheels"

A table that can be set up outdoors is one of the new features of the latest Volkswagen camper. The table's stem fits into a detachable adaptor plate in the spare-wheel hub. The camper, a VW station wagon with living facilities, also boasts enlarged closets, a driver's seat

with revolving back that converts to rear-facing bench, an icebox, washbasin, roof luggage rack, hinged roof sun flap, birch-paneled interior walls, and door canopy. Price is about \$3,000. A kerosene stove, chemical toilet, and the tent shown above are extra-cost equipment.

\$40 Gadget Spots Police Radar—But . . .

RADAR DETECTOR is completely self-contained. It is just clipped to sun visor. The only requirement is that it have a clear "view" through the windshield, unobstructed by any metal.



By Hubert Luckett

SUDDENLY I heard a burbling sound above the faint noise of static coming from the device clipped to my sun visor. The sound changed to a squeal, rising in intensity as I drove. On the shoulder of the road just ahead, I spotted what I had been searching for all morning—an unobtrusive-looking black box mounted on a tripod.

The squeal faded away as I passed it.

A little farther along, half concealed by roadside bushes, were two uniformed patrolmen. One was squatting in front of a radar speed-meter recorder while the other kept his eye on oncoming cars.

The radar detector worked. Just as the maker of this \$40 gadget claimed, it announced the presence of a radar beam by emitting a squeal from a tiny, self-contained speaker.

The instrument, called Radar Sentry, is a palm-size unit powered by mercury

At 70 m.p.h. I was repeatedly warned in time to duck under



CHECKING RADAR RECORD of speed after a trial run. This trip, capture zone was 350 feet from radar antenna; warning came at 400 feet.

batteries. It clips to the sun visor or is held on the metal dash by magnets in its base. It "sees" through the windshield. A single knob turns it on and controls volume. The knob and speaker face the driver when it is in operating position. The Radar Sentry is produced and sold by mail order by Radatron, Inc., North Tonawanda, N. Y.

Next question: Do you get a warning in time for it to do you any good?

The double-check. I looped around on back roads and came through the radar surveillance zone once again. This time I noted carefully the exact point I heard the first burble and the beginning of the steady squeal. A soft-drink sign was my marker for the first, a mailbox for the second. I was traveling at exactly the speed limit—30 m.p.h. The two points were about 50 feet apart.

On the next trip I drove at 10 m.p.h. over the limit until I heard the warning, then braked quickly to about 28. I pulled over just past the cops.

"How fast does the meter say I was going?" I asked.

One of them pointed to the last pip on the chart. "This says 25," he replied.

"That was after you got on the brakes," grinned the other. "I had my eye on you and was sure we had a paying customer."

"Do you mean you will only give a ticket if the red line on that paper says the speed was over the limit?" I asked.

"Yep. That's the only evidence we have," he answered.

Needed: quick reflexes. I watched the meter for a while as a number of cars passed. There was some variation in the point down the road at which the speed was recorded. But the telltale pip was drawn for most cars by the time they were a few feet past the mailbox marking the point at which I had noted the beginning of the steady squeal from the radar detector. Obviously, at this particular setup, a speeder would have had to react very fast to the first feeble indications from the detector to slow down in time to avoid a ticket.

With the cooperation of the police, I made a number of trial runs. We tried various speeds, different ways of aiming the radar and different heights for the radar antenna. In some instances, I was able to pick up the warning much farther away. But checking the recorder after these runs, I found it was also recording my speed farther away. The net gain in warning time was very slight.

In this series of tests, I found I could fairly consistently beat the radar when I drove less than 10 m.p.h. over the 30-m.p.h. speed limit. Of course, the cards were stacked in my favor—I knew the location of the radar and was alert to the first warning squeal. Above 10 m.p.h.



HIGH-SPEED TESTS showed that police could outwit the detector (with practice) by proper choice of location for the radar antenna.

the speed limit until . . .

over the limit, my record wasn't so good. My batting average dropped to about .600. At still higher speeds, the device offered small comfort. About the most you can say is that it gives you advance notice that you are going to get a ticket.

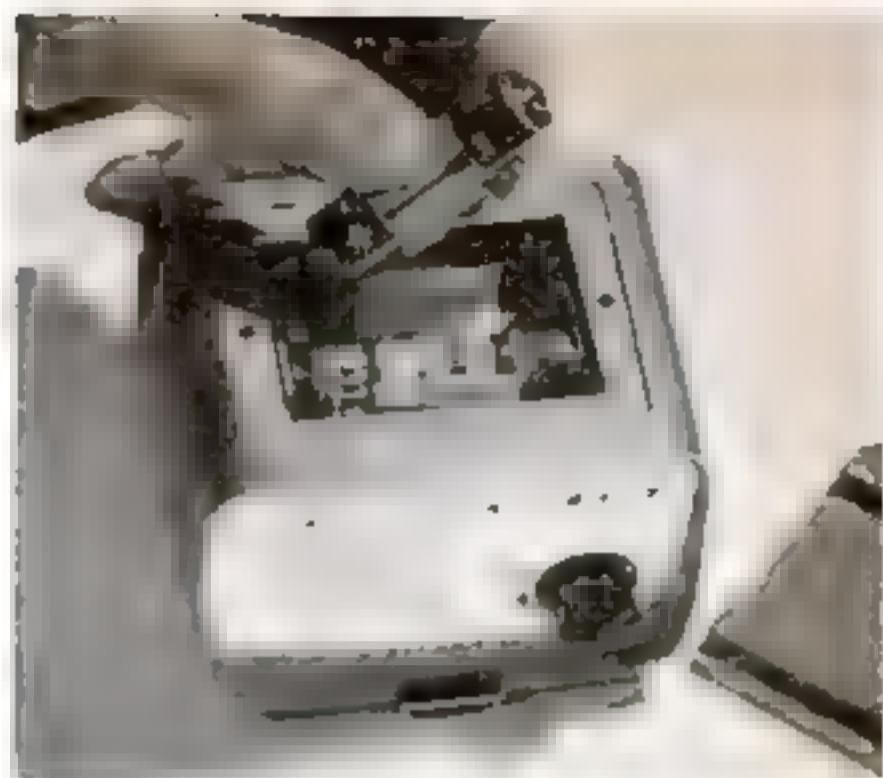
I surveyed the radiation pattern from the radar on foot, carrying the detector. Throughout the capture zone and for 50 odd feet beyond, there was a loud, clear warning tone anywhere you held the instrument from about three feet off the ground to about eight feet, and from one shoulder to the other on this two-lane road.

But farther away, there was uncertainty. Eight feet above the road you might get a loud tone and yet get none at, say, four feet. You might hear it over near the center stripe but not close to the shoulder. It seems that an early warning will depend a whole lot on just plain luck. Later experience verified this conclusion.

I'm crossed up. On different days I found several radar installations "cold" and others by prearrangement. Noise level in the car made a big difference. Wind noise with the windows open at high speeds, the radio playing, or a talkative passenger, greatly reduced the chances of hearing the warning in time. As you would suspect, I did much better when I knew where to expect the radar, even though I made every effort to play it straight and keep a heavy foot on the accelerator until I was sure I heard the squeal.

On one setup in particular, everything seemed to be in my favor. I consistently drove along this stretch of road hitting 70 (with police permission) and was able to drop below the 50 m.p.h. limit after the warning and before the radar recorded my speed. I did, that is, until a smart radar cop crossed me up. While I was making my turn-around for another run, he moved the radar antenna to a more favorable location. This time he had me.

Technically the device is an electromagnetic radiation detector, tuned to 2,455 megacycles, which is the frequency assigned to police radar. The back cover of the metal case forms an integral slot antenna. The detector uses eight trans-



MERCURY BATTERIES, claimed to be good for several thousand miles of driving, furnish power for the eight transistors used in the circuit.

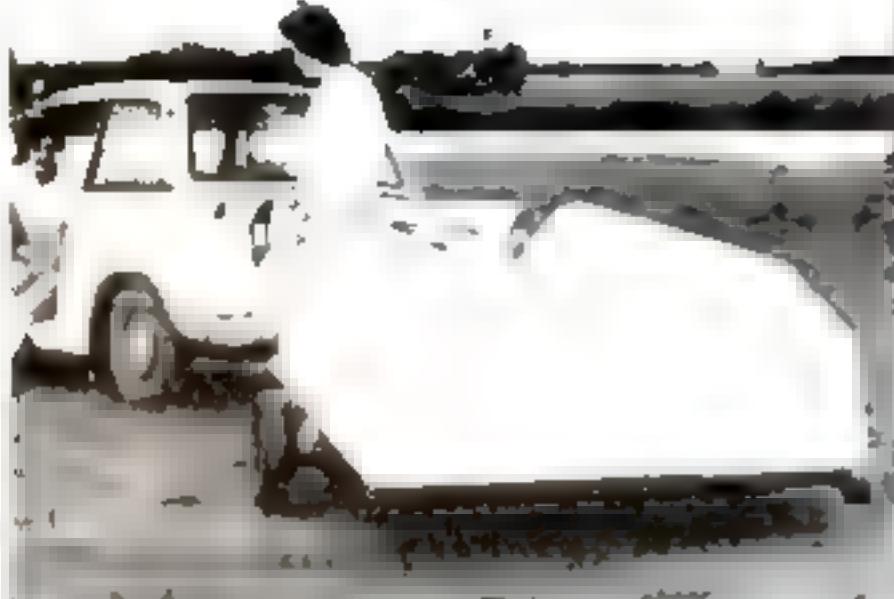


INSIDE VIEW OF DETECTOR shows instrument-quality construction. A printed-circuit board is used. Slot antenna is in the back cover.

sistors and two radar-type crystal diodes.

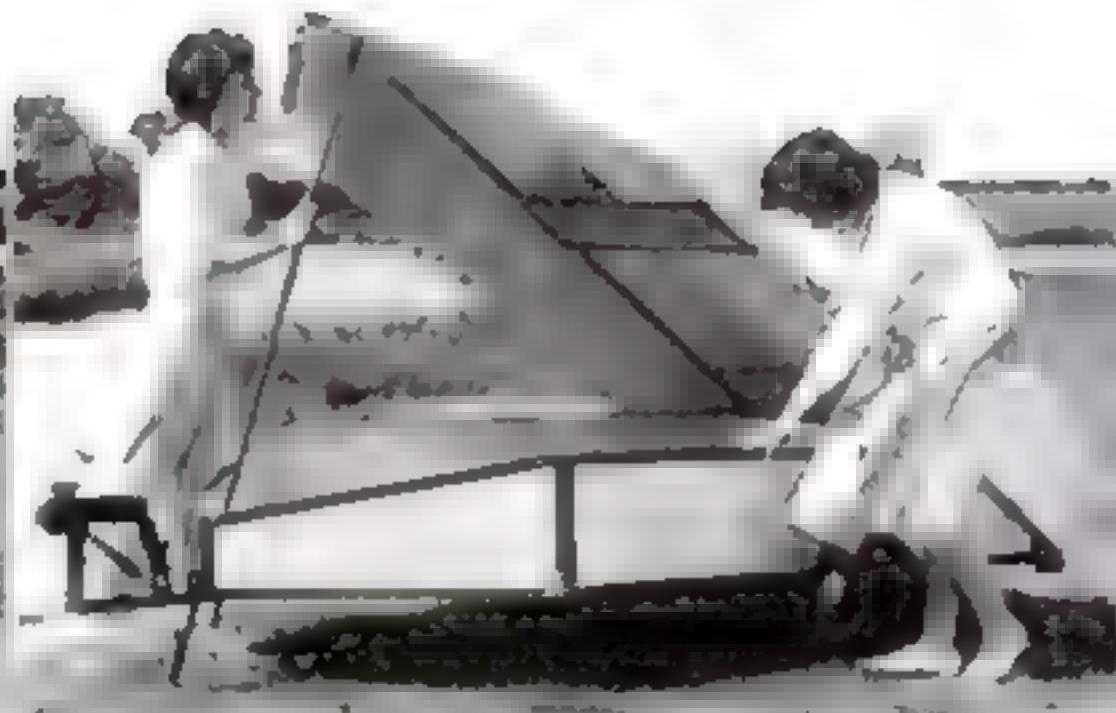
The manufacturer is unwilling to give circuit details and builds it so that the hook-up is hidden. But inspection suggests a relaxation oscillator circuit set up to produce the audible tone. The operating voltages might be adjusted so it would not quite oscillate, but a small change in one would cause it to break into oscillation. Energy from the radar beam, picked up by the slot antenna and rectified by the crystal diodes, could supply the voltage required to start oscillation. There is some corroboration for this guess. If you apply a small DC voltage from a flashlight cell across the diodes, you get the same squeal produced by the radar beam.





Haul low-profile trailer behind your car . . .

Collapsible trailer converts at camp site to both tent and boat



. . . take it apart at your camping site . . .

Tow this British-made fiber-glass trailer to the water, and you're all set for a camping holiday. You can take the lid off and use it as a boat, sturdy enough to hold an outboard motor on its transom.



World's fastest helicopter

A helicopter speed record of 192.9 m.p.h. was set when this Navy twin-turbine Sikorsky HSS-2 flashed past the photo-timer. Cmdr. Patrick L. Sullivan and Lt. Beverly W. Witherspoon set the mark on an official three-kilometer course (1.86 miles) at Bradley Field, Windsor Locks, Conn.

Later they flew the big copter 100 kilometers from Milford to Westbrook, Conn., at 174.9 m.p.h.—a new record for the distance.

Both are pilots at the Naval Air Test Center at Patuxent River, Md. The previous mark was 167.09 m.p.h. made by a Russian Mil-6 in 1959.



Pipe crosses river

Putting on an act reminiscent of Scotland's Loch Ness monster, a section of pipeline is pulled here across the Kootenai River at Bonners Ferry, Idaho. Its bent neck was plugged to keep out water, and the 36-inch-diameter pipe was coated with concrete to overcome buoyancy.

It will connect with the casing in the left foreground to form a link in a line delivering gas from Canada to utilities serving cities on the Pacific Coast.



... use top half upside down as a boat ...

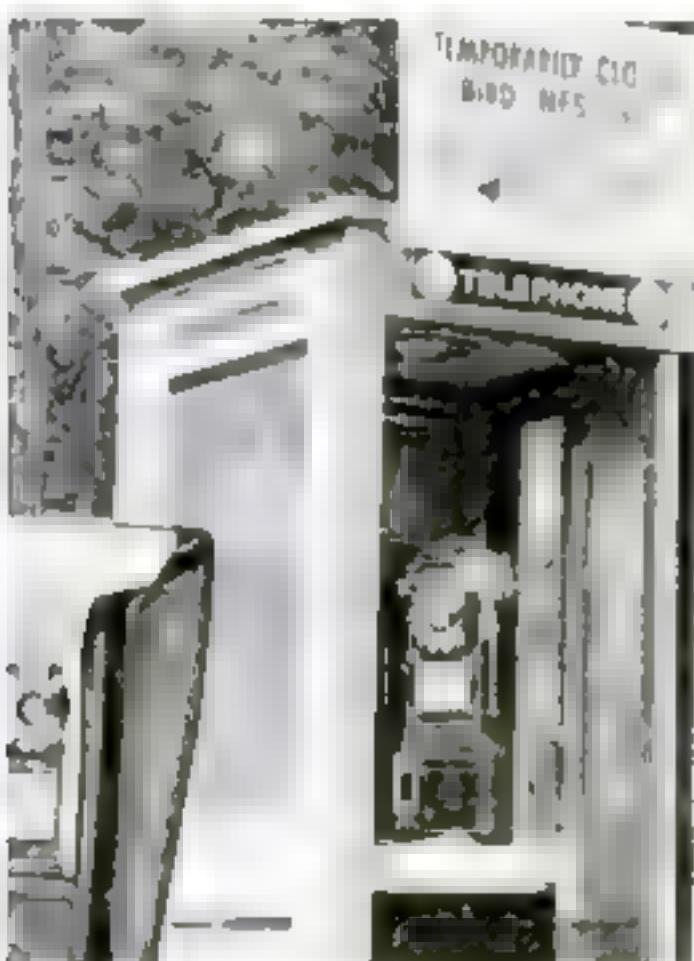
Then, when you call it a day, you can prop it up on three poles, and it becomes a roof over sleeping quarters for two adults and two children. Fabric sides are zippered at the corners so you can



... and flip it back over to roof your tent.

roll up one or more as you would flaps.

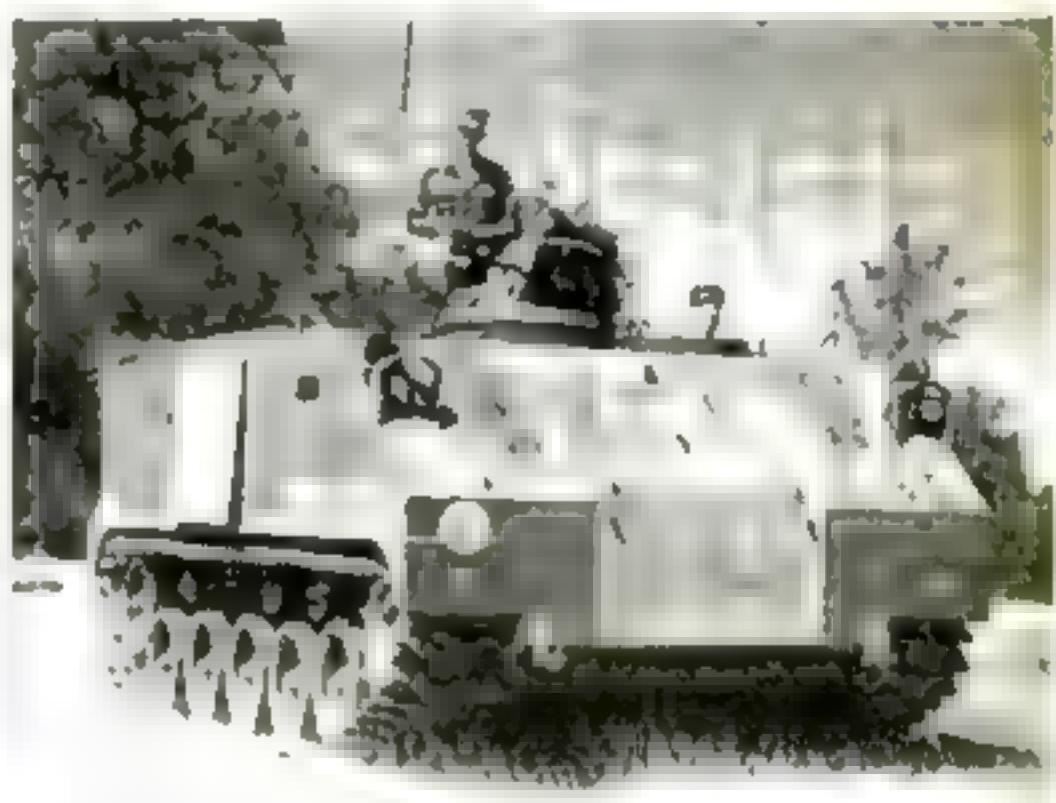
Collapsed, the trailer is 31 inches high, 62 wide, 132 long, and weighs 224 pounds. Besides the tent poles and flaps, it will carry considerable luggage.



This line is busy

When a bird nested on top of a pay telephone in an outdoor booth, the phone company came to the rescue—of both nature lovers and potential users.

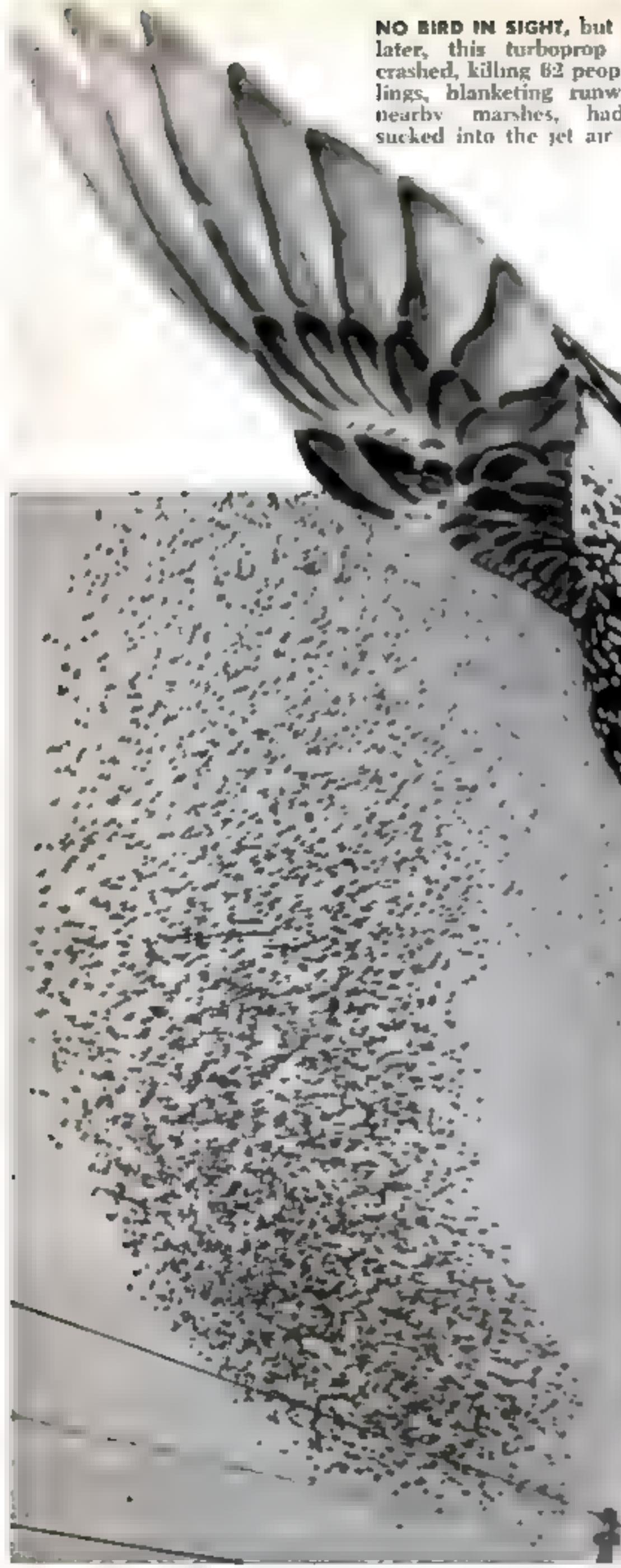
The Chesapeake & Potomac Telephone Co. installed another phone outside the booth at the Naval Ordnance Laboratory in White Oak, Md., and temporarily disconnected the birds.



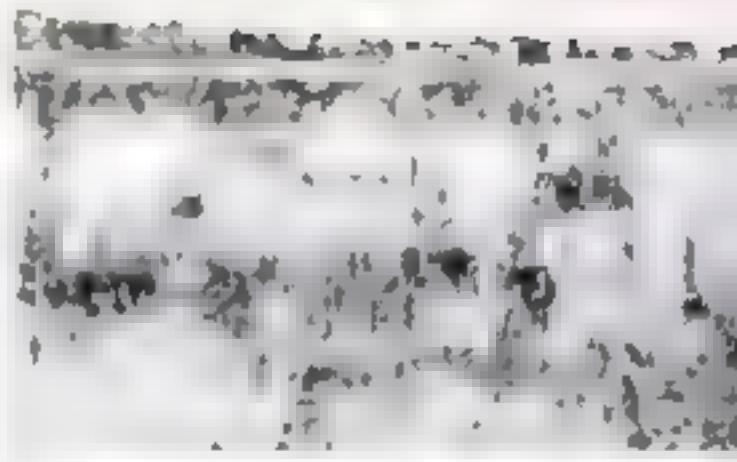
Battlefield casualty locator

Wounded soldiers need only flick a toggle on a portable radio-signal beamer to get help. Medics in armored personnel carriers are equipped with receivers that home in on the casualty's position by tone control. The locating system was developed by Ryan Aeronautics. The photo above shows a test by the Army at Camp Roberts, Calif.





NO BIRD IN SIGHT, but seconds later, this turboprop Electra crashed, killing 62 people. Starlings, blanketing runway and nearby marshes, had been sucked into the jet air intakes.

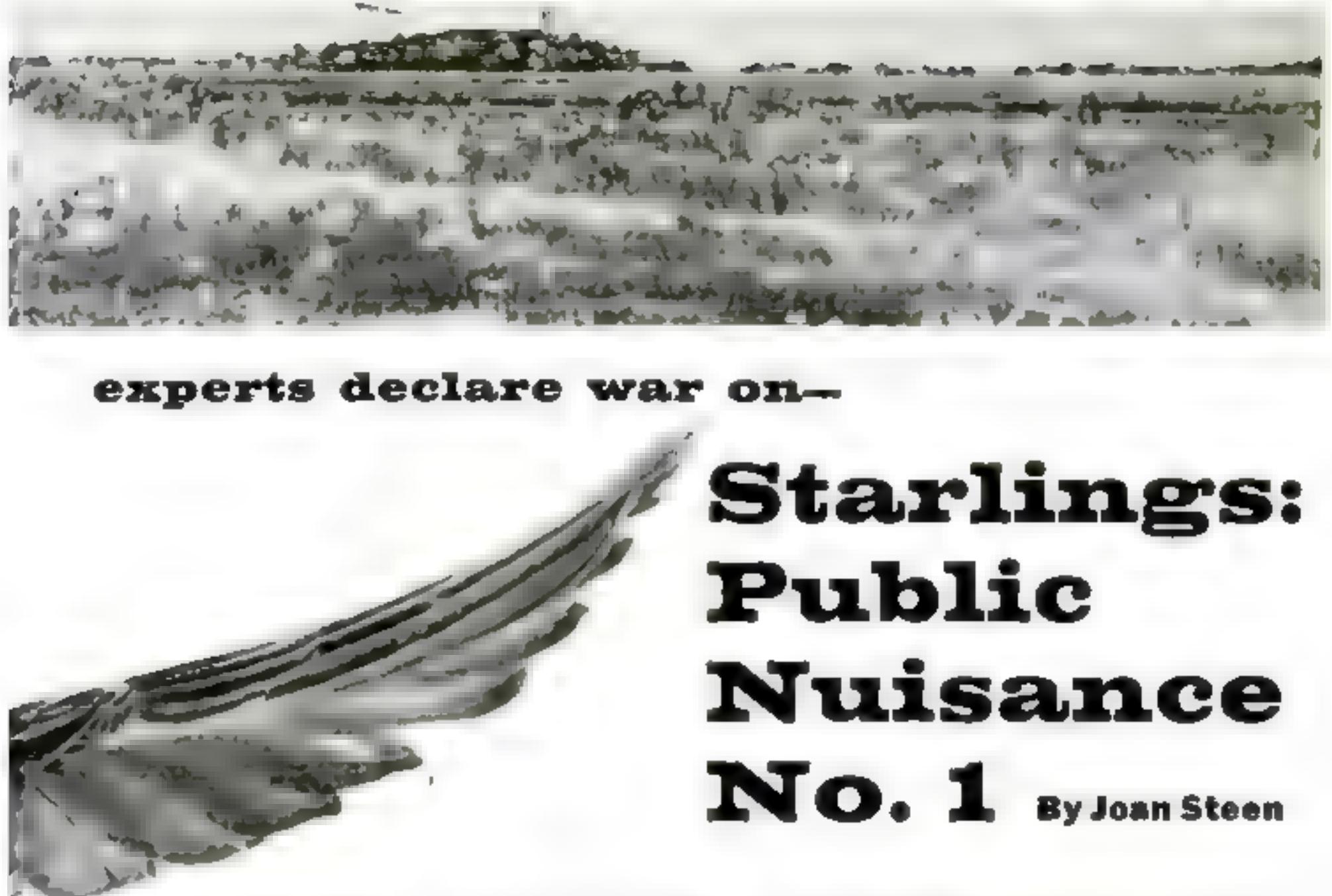


U.S. wildlife



NOT A BAD LOOKER, the English starling has brains as well. The robin-size bird, iridescent in spring, appears mottled in fall. A stranger in 1890, it proved so adaptable that it's now found everywhere in the U.S.

STARLINGS BLACKEN THE SKY in a tornado-like cloud, and, flying in flocks of thousands, they can be just as dangerous. Unfussy about food or climate, they're a menace alike to farmers, cattlemen, and fruit growers.



experts declare war on—

Starlings: Public Nuisance No. 1

By Joan Steen

STARLINGS are darn smart. So smart they've soared from simple nuisances to serious threats in a few years. When a flock got sucked into the air intakes of a turboprop Electra during a takeoff at Boston last fall, the threat proved fatal. The plane stalled and spun in, killing 62 of the 72 aboard. The time had come, officials agreed, to take starlings seriously.

That is what farmers, cattlemen, fruit growers, and incensed citizens have been saying for years. Orchard owners in Oregon tell of complete devastation of their trees; vineyard keepers in the Southwest have lost their choicest grapes; cattlemen have had livestock feed contaminated or ruined.

Now the Government is interested. The aviation and space agencies want ways to handle the problem of birds versus engines. The U. S. Fish and Wildlife Service wants to solve the farmers' plight.

The villain of the piece is a dark-spangled, shapely bird about 8½ inches long, weighing about as much as a robin. From a distance the starling looks like a slightly hump-backed blackbird (al-

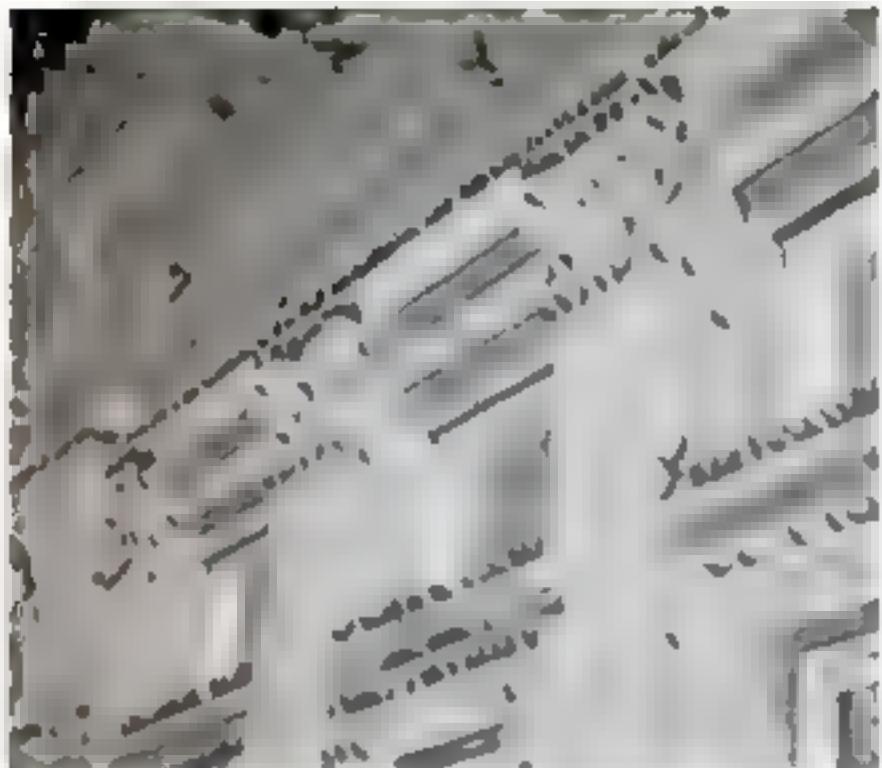
though its tail is shorter and droopier). But it's no relative. Starlings do have one famous cousin—the mynah bird.

Oil-slick looks. During spring and summer, they're yellow-billed and their iridescence is at its gleaming best. Like an oil slick on water, their luminous look is caused by reflection and refraction of the sun's rays. But after a season's battering, starlings look shopworn. The birds are freckled with beige spots, their crisp feather edges are blunted, and their bills have darkened.

Until 71 years ago there wasn't a starling in North America. They were freakishly introduced when Eugene Scheiffelin released 100 English starlings in New York's Central Park. His innocent objective: to acquaint Americans with all the birds mentioned by Shakespeare.

And they multiplied. Blessed with an enemyless Eden plus an eerie adaptability, *Sturnus vulgaris* began to live up to its name: It spread with uncommon ease to all compass points. By 1939, starlings had moved out to Kansas, Oklahoma, Texas, and across both borders. By 1942, a few pioneers made it to California. They

Poison, shock, noise, and nets all help thwart starlings, but



CITY STARLINGS take over public buildings. Here it's a courthouse in Frankfort, Ind. U. S. Fish and Wildlife eviction experts are fighting back with shock treatment and poisons.

multiplied astonishingly: In 1947 one starling was seen in British Columbia; by 1953 the estimate was 500; five years later it was 25,000.

The pioneers are the new brood who face a housing shortage if they stick around where they were born. So they begin making tentative sorties into new regions. After advance parties have explored the new territory for upwards of 20 years, a huge wave moves in to nest. California's time is now up.

Things wouldn't be so bad if the birds weren't so prolific (sometimes producing three broods a year), or so omnivorous (if it's edible they like it), or so hardy (any climate is fine). But they're organized. They move in vast flocks, apparently recognize group leaders. One naturalist in North Africa describes the awesome sight of migrant starlings in Tunisia. Each morning just before sunrise, silence descends on the flock—dead silence—where during the night there have been fitful peeps and chirps. Then all at once they take wing. In a few seconds, millions of them blacken the air on their way to the olive groves. There they eat their way through an incredible 165 tons of olives a day.

Wary and wily. They behave shrewdly in small groups, too—if they let you watch them. Starlings are notoriously nervous birds, quick to steer clear of intruders. A biology field worker handled

and marked one egg in a nest while the parents were out hunting food. A week later the marked egg was found four inches away from the others and cold.

But what's more remarkable is their teamwork. Pairs of nesting starlings will settle an area and unite to keep other birds out. This often means destroying existing nests and taking over. Once, when a newly arrived pair of starlings observed a robin getting ready to move into an abandoned woodpecker hole—a favorite starling haunt—the pair immediately enlisted the aid of resident starlings. Pair I squawked and twitted until the robin flew off to chase them. When she returned, Pair II was waiting to carry on the psychological warfare. The robin soon gave up.

Is there any hope? Faced with such talents, it's not easy to come up with sure-fire controls. The Boston disaster led the Federal Aviation Agency to allocate \$100,000 to the U. S. Fish and Wildlife Service to study the problem. In the meantime FAA test engineers are considering redesigning jet air intakes. Some ideas: a ring-shaped intake; an inflatable intake guard; a revolving inertial separator (the heavier-weighted birds would be shaken out); macerating devices.

The fight is not unlike a military operation. Should you build strategic defenses or look for the means to deal a decisive blow? So far the battery of controls runs to deterrents:

- **Shock treatment.** An effective but expensive control is to wire the roosting areas of buildings. The wires themselves and the magnetic field extending four inches on either side of the negative wire

STARLINGS FLUSHED FROM ROOSTS on a pitch-black night will fly straight toward the lights at the back of this large funnel-shaped net. (U. S. Fish and Wildlife Service photos.)

no one yet has found **THE** answer

set up a shock area. One 450-volt DC jolt, and the birds take off. This is what Washington is doing—after years of suffering national mortification from sullied and blackened buildings. There's one trouble—wire one building and you have to wire them all. Otherwise the birds just move across the street.

● *Sticky-foot poison.* A poison in a viscous oil base has been tried experimentally. The poison is spread on parallel pipes a few feet above ground. Cattlefeed laced with it is also spread as bait between the pipes. The birds perch and munch, absorbing the poison through their feet. Its delayed action is timed so that the birds will return to their roosts to die.

This sounds ruthless, and is. And there are dangers. No one knows how harmful the poison may be to plants and trees, or how easily it may be spread.

● *Floodlight traps.* This is an efficient way to trap a lot of starlings in one place. A net—a very large funnel-shaped affair—is spread close to a densely populated roost. On a pitch-dark night (this is essential) spotlights inside the net are turned on at the same time the birds are flushed from their roosts. The birds fly straight toward the light. As many as 100,000 can be bagged this way, and wildlife researchers find it a quick and easy way to band them for study. If it's desirable to do away with them, they can be painlessly gassed.

● *Fog guns.* Another way of administering a lethal dose of gas is to fire it from a gun. At short range this proves very effective. But someone has sensibly asked: How do you get the birds to sit still long enough to sniff a fatal dose?

● *The sound barrage.* Among the "black box" deterrents are a variety of devices, some bogus, some effective. Gordon W. Boudreau's recordings of starling distress screeches are particularly potent bird chasers. But if they're played at a long-held roost, the birds seem to catch on. Apparently they can out-Pavlov Pavlov in associative skills.

The same goes for shotguns, firecrackers, or other noisemaking machines. The birds either realize in short order that the noise is meant to scare them or else

[Continued on page 222]



SCARE-'EM TACTICS: One way to cope with a plague of starlings is to bombard them with noise. The automatic acetylene exploder above does just that.

STICKY POISONS will work, too. The man on the ladder is squirting the goo into favorite starling niches. All of them have to be filled—otherwise the birds just move over a bit.

ULTRASONIC HORN is one of the newer kinds of starling shooters. But the best sound weapons may be records of distress calls.



Why Inventing Is Still a

By Lynn A. Williams



Mr. Williams, president of Anocut Engineering Co., is himself an inventor — his latest invention being a process for electrolytic metal removal. This article is adapted from a speech he made recently before the Society of Automotive Engineers.

ONE of the surprises of modern industrial life is the relatively small contribution of large industrial corporations to the sum total of significant creative and new ideas. Historically, important new ideas have come through individual initiative. They have come less often from the laboratories of our great industrial corporations.

They have not come from committees, they have not come from teamwork, they have not come from organization; but, in very large part, they have come from individuals, often working almost alone and, very frequently, under surprising and often unpromising conditions.

Despite the tremendous size, power, and wealth of our largest industrial firms, and despite the fact that they are totally immersed in technology, their contributions have been far greater in production and in marketing than in creativity.

I am convinced, both by history and by present circumstances, that this is not likely to change. It will not be changed by "brainstorming" or "pyramiding." It will not be changed by plan or organization. A disproportionately large quota of new ideas will continue to come from individuals. The large industrial giants will continue in their roles as developers rather than creators, as producers rather than as innovators.

HISTORY, sociology, and what I term "accident" account for this.

This is not to say that corporations have invented nothing. There have been important inventions by men working within American big business. The transistor resulted from an idea suggested by Dr. Shockley at the Bell Laboratories. Freon refrigerants came from Midgely after he went to work for General Motors. Nylon was originated by a man in the DuPont laboratories. There are others.

The modern corporation has often been superb in development and improvement.

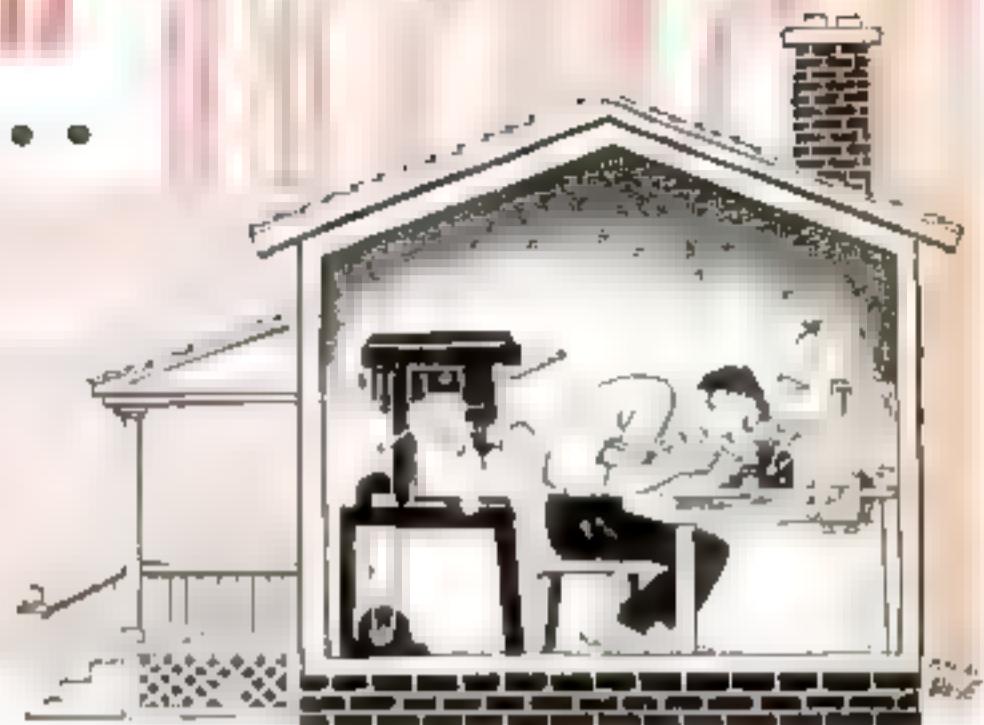
But the creative idea is something else. It is the pregnant suggestion that sets in motion a whole series of new consequences. One consequence is the development, improvement, refinement, manufacture, and marketing of the product that rests on the idea.

For history, let's look at some inventions familiar to us.

The expansion steam engine was invented by Watt, and the steamboat by Fulton. The telegraph was invented by Samuel Morse, the cotton gin by Eli Whitney. And, of course, Edison invented the incandescent lamp, the phonograph, and the moving picture.

The first significant breakthrough in the making of steel was by Bessemer. The steam turbine came from Parson. The process of refining and producing aluminum, still used to-

One-Man Job



day, was invented privately by Hall and Cowles in the United States and, almost simultaneously, by Heroult in France.

A salesman for bottle stoppers invented the safety razor. His name was Gillette. Wireless was invented by Marconi. It was not the telephone company or General Electric or Westinghouse that invented the three-element vacuum tube. This was the work of Lee de Forest. The modern plastics industry began with Dr. Baekeland and Bakelite.

Perhaps these things are too old to be relevant today. Very well, insulin was discovered in the 1920s not by anyone in a great pharmaceutical house but by Dr. Banting of Canada. A private experimenter, Dr. Fleming, found penicillin. Streptomycin was found by Dr. Waksman, polio vaccine by Dr. Salk.

The gyrocompass, so important to our rocketry, was invented by a German named Anschutz-Kaempfe. Frequency modulation was invented not by RCA but by Dr. Armstrong. Kodachrome film was invented not by the Eastman company but by Godowsky and Mannes, who did much of their early work in a kitchen sink.

The Polaroid camera was invented by Dr. Land, whose early work on polarizing films was done when he was 20 years old and still a student at Harvard. Stainless steel was developed not by any of the major steel companies but by two scientific entrepreneurs, Harry Brearley and Elwood Haynes. The cotton picker was invented not by International Harvester but by the Rust brothers. Cellophane was not the invention of the Du Pont company but of a Swiss-born Frenchman, Jacques Brandenberger.

IN THE field of nuclear development, it was Ernest Lawrence, University of California scientist, who invented the cyclotron. The major inventions for the atomic bomb and much of the ensuing nuclear work were by individuals like Niels Bohr, Enrico Fermi, Edward Teller, Harold Urey, and Leo Szilard.

Important new ideas have come, in very large part, from individuals, often working alone and under unpromising conditions.



Critics have observed that the giant corporations have indulged in welfarism to a degree beyond the dream of any Utopian socialist.



The oddball inventor is disturbing. His habits don't fit into a smooth-running organization.



A basic reason why our big corporations will not come to dominate creativity lies in "accident." Invention defies planning.

The automobile? A number of major inventions stem from ideas within the industry. The outstanding one is the automatic transmission, initiated by Thompson while he was at Cadillac and carried by him to Oldsmobile. (The hydraulic torque converter, however, was the work of individuals not associated with any large firm.) Duco body finishing was invented by Du Pont. The sealed beam headlight came from within the industry.

But the four-cycle engine was Otto's, of Germany, and the two-cycle Dr. Diesel's. Vulcanized rubber was the invention of a man named Goodyear and the pneumatic tire of an Englishman, Dr. Dunlop. The self-starter was invented by Vincent Bendix, and by Kettering before he became associated with General Motors.

Four-wheel hydraulic brakes were invented by Loughead, power steering by Davis, and chromium plating by Dr. Fink, a professor at Columbia.

SO MUCH for history. The second reason that the individual inventor will continue to bulk so large in our scientific progress lies in sociology.

Critics (with whom I don't agree) have observed that the giant corporations have indulged in welfarism, particularly for the supervisory classes, to a degree beyond the dream of any Utopian socialist. They say that the brass, including many engineers, of today's big industrial firms is weaned, fed, clothed, schooled, doctored and hospitalized, has his adult being in, and can be buried without leaving, the comfortable company corridor. Let him make the company's first team, and the likelihood of his ever getting fired is remote indeed.

What has such a man to gain by propounding an original idea? Not much. His sure path to success lies in being a good little cooperator and keeping his nose clean.

So say the critics. They may expose a grain of truth in a Sahara of unrestraint. But there are at least four more valid reasons that prevent a factory from being a fertile ground for creative ideas.

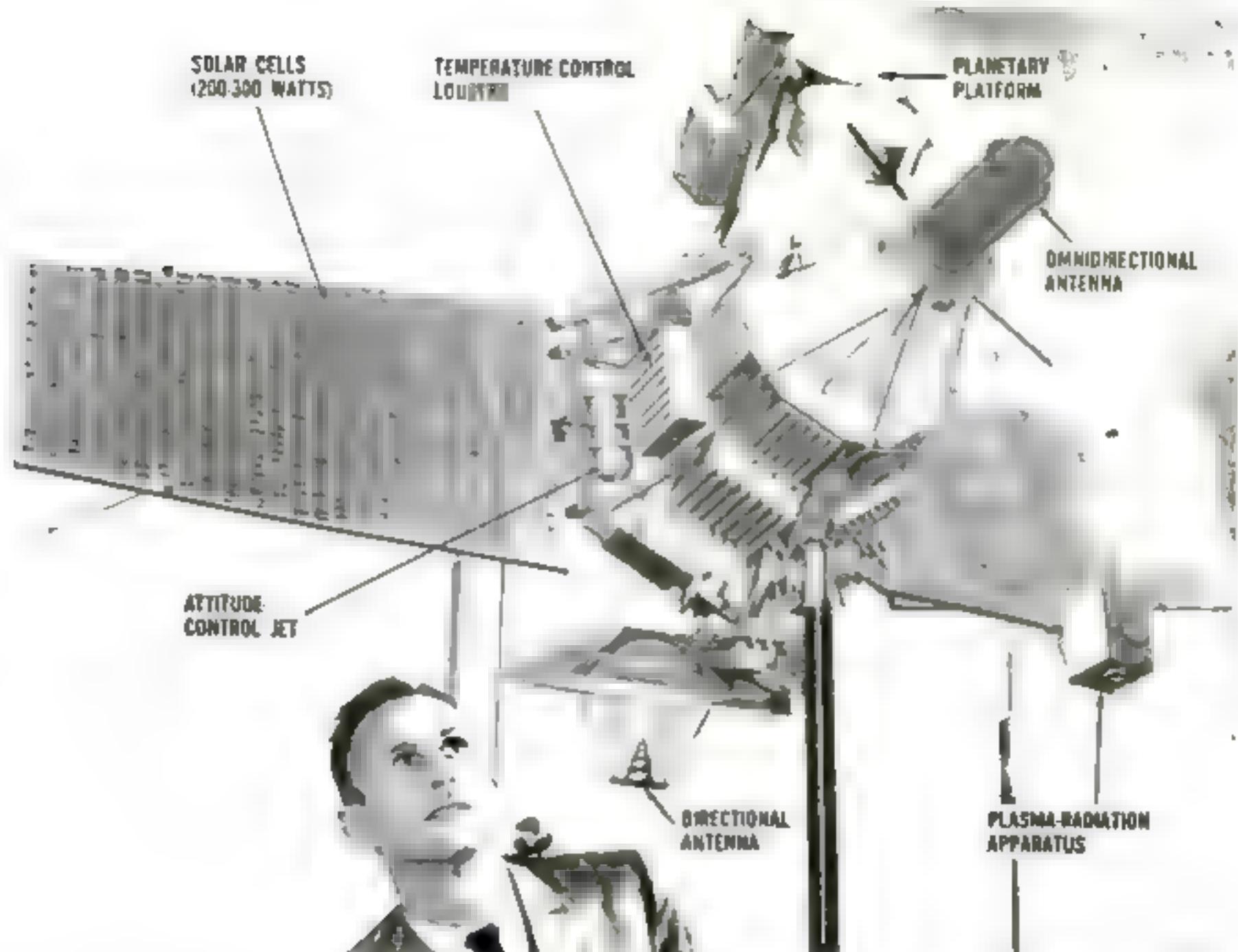
The basic purpose of a factory is to produce. To produce efficiently requires planning. Planning requires deadlines, and introducing new ideas along the way disrupts them.

Again, a big factory must avoid mistakes. If I am building a boat in my basement and put a hole in the wrong place, I can plug it and paint it over. But if I am producing 3,000 automobiles a week and put a hole in the wrong place, in a week's time I have a major crisis. It takes a lot of nerve to change things in a factory.

Creativity also involves emotional costs which most managements cannot and will not accept. Every innovator is an iconoclast. His new idea is an attack on an older idea. Through extension, it seems like an attack on the men who are in charge of the old idea—which means the men who are in charge of almost everything.

THE oddball innovator is disturbing. His habits don't fit into a smooth-running organization. I learned this rather poignantly when, as a division manager for a large corpor-

[Continued on page 220]



Space probe to fly past planet Venus

A 1,000-pound spacecraft, Mariner-A, is being built by Caltech's Jet Propulsion Laboratory for detailed investigation of the planet Venus. It's more advanced than Surveyor [PS, June '61], the space probe scheduled for the moon, because of the greater distance it will travel: 26 million miles. The photo above is of a model. The actual space probe will be 8 feet high, 19 feet across from tip to tip of its solar panels. Mariner-B, slated for a later fly-by trip to Mars, will be similar in appearance.

Mariner-A will blast off late next year on an Atlas-Centaur for the three-month

journey. After leaving the rocket, it will be oriented both by the sun and by small jets triggered by radio from the earth. It will pass within 16,700 miles of Venus, and cram data into a memory system for 8 hours—enough to provide 48 hours of telemetering back to earth. Then the craft will go into perpetual orbit around the sun.

Instruments on a planetary platform moving on two axes will record radiation, ultraviolet rays, magnetic fields, and Venus's gravity, temperature, and atmospheric conditions. Infrared scanners will keep them trained on the planet.

School-bus shelter

Steel shelters such as the one at right give protection from weather and traffic to children waiting for school buses. The structures are provided without cost to communities by a Philadelphia subsidiary of a big appliance distributor. Revenue comes from paid advertising carried on the sides.

Each shelter is anchored to a 3,000-pound concrete slab. Up to 14 children can be accommodated in each.

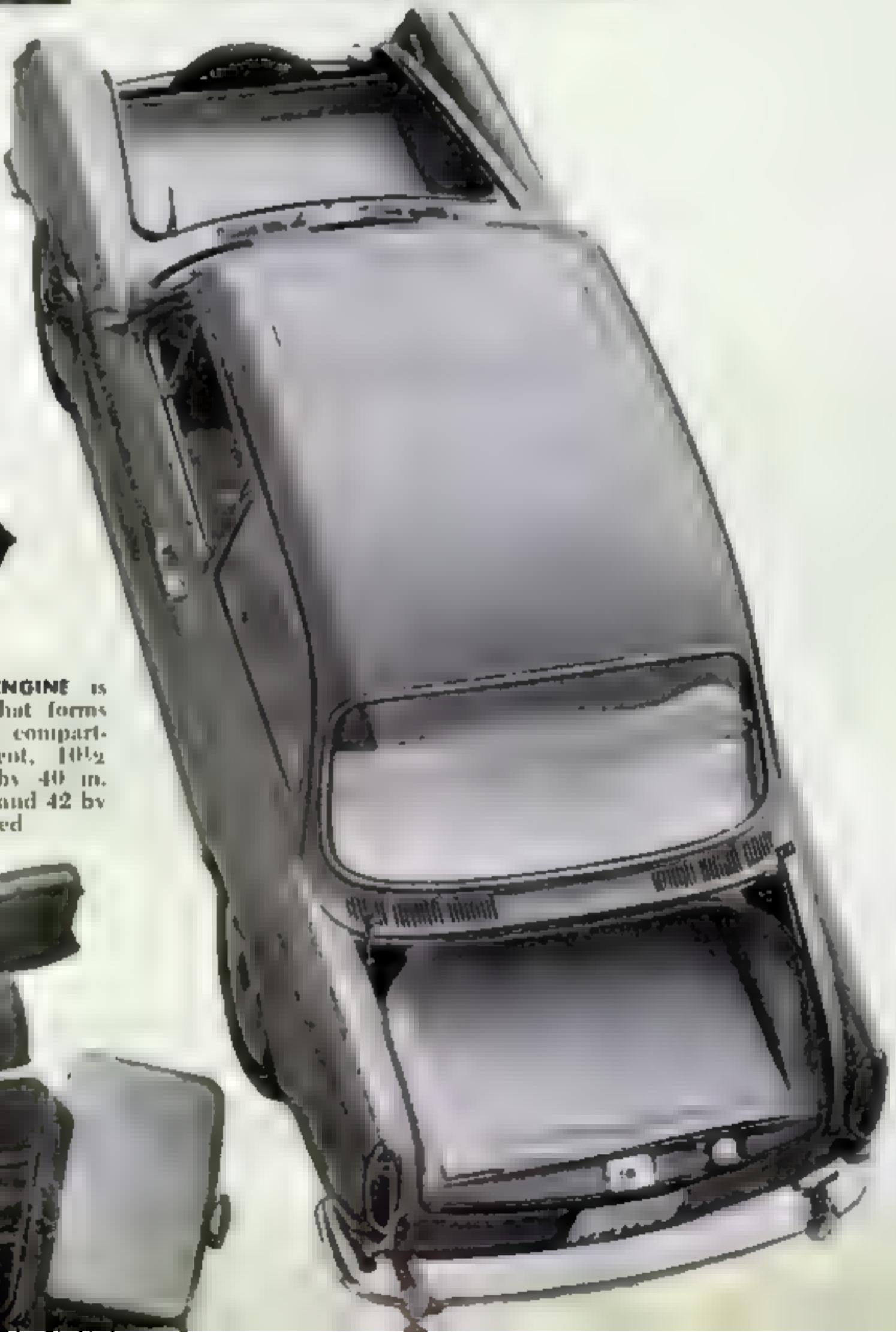


Inside the New and Bigger VW

Germany's stubby beetle goes stylish, with a huskier, sassier engine, in the first radical changes in its history

VW 1500 has top speed at least 10 miles an hour higher than that of standard Volkswagen. Cars above are tooling around VW test track.

FOUR-CYLINDER REAR ENGINE is hidden beneath panel that forms floor for extra luggage compartment. Front compartment, 10½ in. high, measures 27 by 40 in. Rear one is 9½ in. high and 42 by 35. Leg room is increased



By Devon Francis

THAT spanking-new Volkswagen you've been hearing about was officially unveiled last month.

It looks nothing at all like its beetle-shaped parent. Its lines, in fact, would suggest that Detroit had a hand in styling it. By the performance yardstick that Europe applies to cars in its price class, it's full of beans. A pancake engine is still there in the stern, but gone is the cooling-fan belt.

The car embodies the first radical changes in VW's history.

Designated the 1500 (a nice round figure derived from the 1,493 cubic centimeters in its engine displacement), it compares with the old one:

| Volkswagen VW 1500 | |
|--------------------|--|
| Overall length | 160 in. 166.3 in. |
| Width | 60.6 in. 63.2 in. |
| Height | 59 in. 58.1 in. |
| Curb weight | 1,631 lb. 1,896 lb. |
| Horsepower | 40 @ 3,900 53 @ 4,000 r.p.m. r.p.m. |
| Piston disp. | 72.74 cu. in. 91.09 cu. in. |
| Comp. ratio | 7:1 7.2:1 |
| Bore | 3.031 in. 3.3 in. |
| Stroke | 2.52 in. 2.7 in. |

The wheelbase for the two cars is the same—94.5 inches.

And now that this bagful of goodies has been dangled before your eyes, you're due for a disappointment: The VW 1500



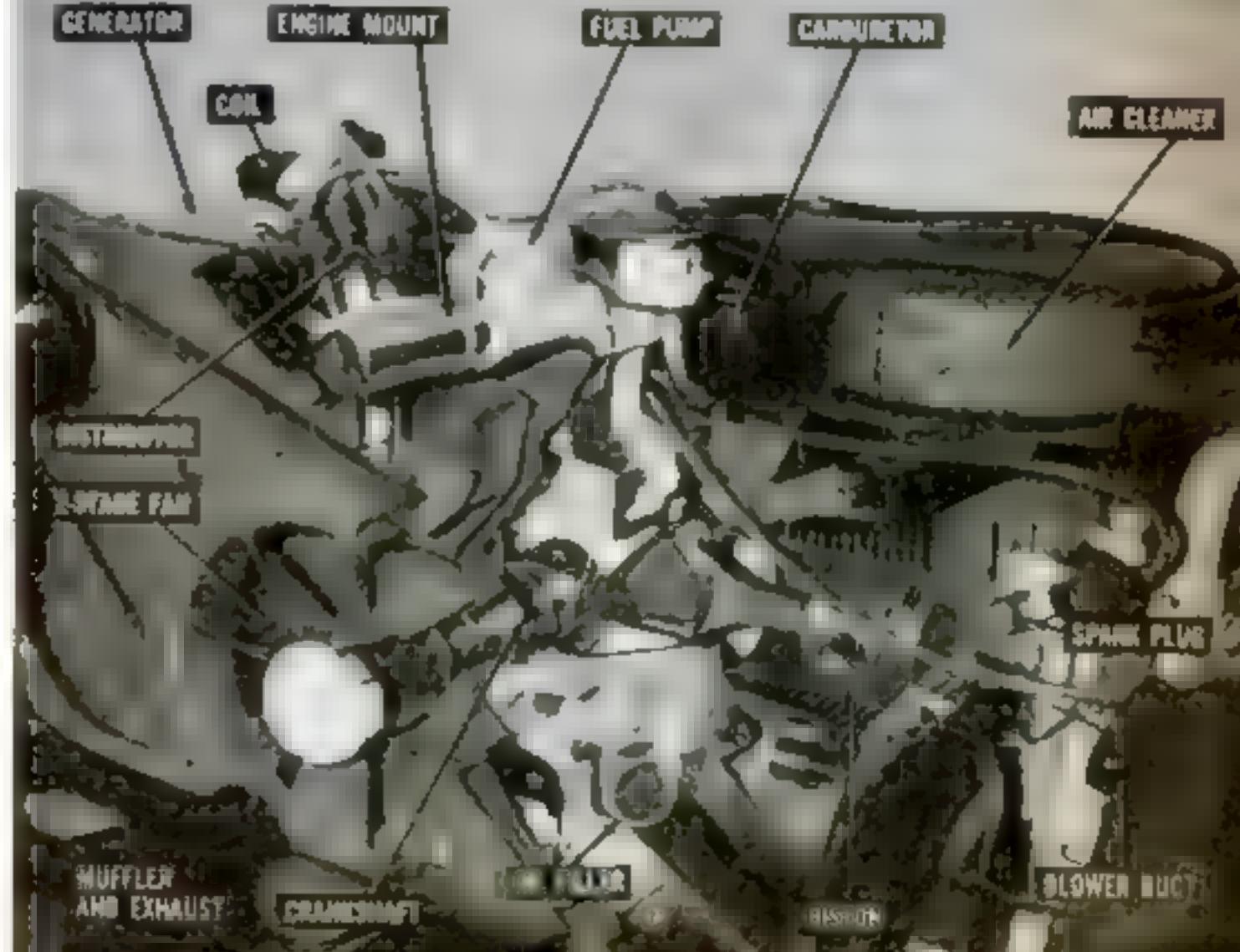
COMPLETE BREAK WITH TRADITION is emphasized by these comparison views of standard VW and new one. Weight is distributed 60 percent rear, 40 front. Chevy Corvair's is 63-37.

will not be sold in the U. S., at least for the present.

The company, Volkswagenwerk A. G., says it's for distribution solely in Europe and among those citizens of the other 120 countries where Volkswagens are sold. If it were sold over here now, it would cost roughly \$2,000, compared with \$1,595 for the regular VW two-door sedan at the New York port of entry.

Why a new VW? The VW people ad-
CONTINUED

BIG CHANGE in engine, as shown in this cutaway, is in the air-cooling fan. Replacing big, belt-driven, radial-type blower is two-unit fan—one radial, one axial—driven directly off crankshaft. This supplies five parts of cooling air for engine, one part fresh air for warming passengers, plus carburetor air. Axial fan's diameter is 7½ in., radial's 12 in. In standard VW, heating air is ducted to car's interior after cooling cylinders. Newly positioned dipstick is attached to underside of the oil-filler cap.



The VW 1500 looks like a leaf out of Detroit's style

vance some plausible explanations for denying the new car to potential American customers. They say that for what it offers in performance, the 1500 could not compete in price with domestic compacts. They say they haven't the cars to send over here—production of the 1500 this year will amount to only 75,000 out of a total of a million vehicles. They say their dealers would have to stock parts for another car.

This may be a new high in tortured reasoning. As production of the 1500 rises, the price will inevitably drop. U. S. VW dealers would snap at the chance to sell it. Anyone who believes that Volkswagen's new automobile won't appear over here—particularly if the booming sales of the regular VW begin to level off—may go soak his head in a bucket.

This *POPULAR SCIENCE* reporter saw and drove a handmade prototype of the new VW at the factory in Wolfsburg, Germany, last May.

The car is cannily designed to look economical—as if it had been built by especially dollar-conscious elves in the Black Forest. Sieved through the practical German mind, it works out pretty well. The styling is tasty, and even smart, when the old and new cars are put side by side. The front end carries a faint suggestion of Renault's sparkling Caravelle. There is loads of glass area.

Germans aren't used to U. S.-style inquisitive magazine reporting.



HOODED INSTRUMENTS now include a gas gauge as well as an oil temperature and pressure gauge, a speedometer, and clock. A trick lever on left doorjamb locks lid over the rear deck.

"Who styled your car?" you ask a passel of VW dignitaries.

"Nobody. We have no stylists."

"But somebody," you protest, "had to draw a picture of it in advance."

"Well, we employ consultants."

Pursue that dead end if you want to. At the end of 10 minutes you're right where you started.

Frau Nordhoff's handrail. Instruments are hooded in the best Detroit fashion. On the right side of the dash is a handrail like that in a Chevy Corvette. This same handrail appeared some months ago on the regular VW. To carry the Detroit analogy further, even as the wives of reigning vice presidents over here suggest changes in cars in the cocoon stage, so did Frau Charlotte Nordhoff, wife of the Volkswagenwerk director-general, ask her husband why he didn't supply a grab bar for his right front-seat passengers.

There's a gas gauge, even as there is on the regular VWs now beginning to arrive in the U. S. The hardware is elegant, even by Cadillac standards.

Apart from looks, the new VW differs from its forebear in mechanical innards. The engine is Volkswagen only in principle. The manufacturer calls it a "suitcase" engine. It's nine inches lower than that in the regular VW, largely due to a new type of fan for the air-cooled cylinders.

The decapitation makes possible the addition of a station wagon to the line.

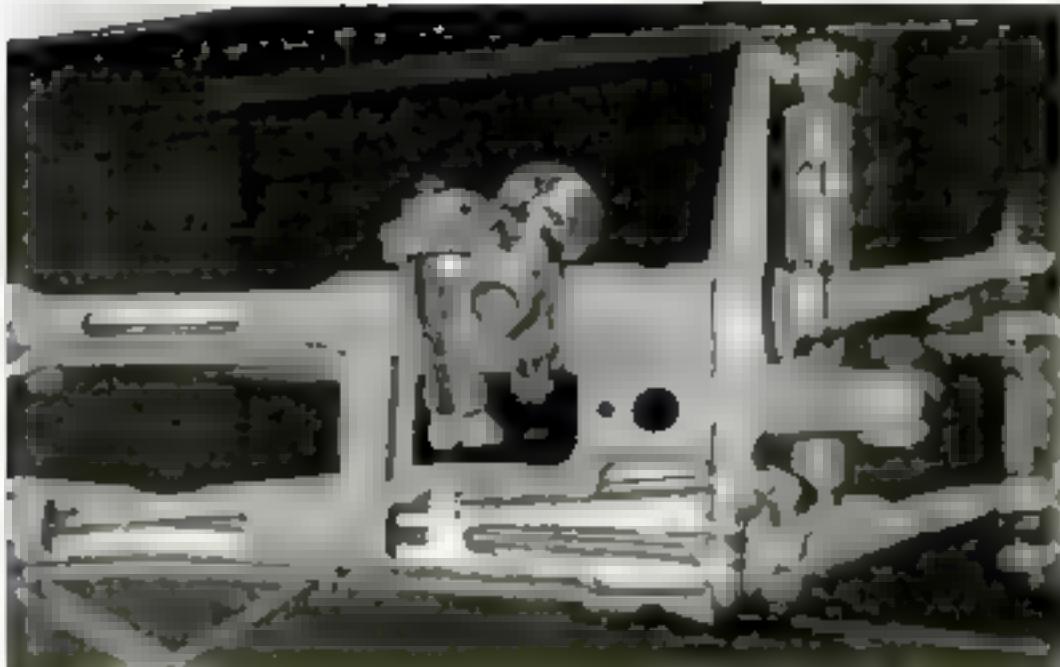
Like the standard engine, the new one has no cylinder block as such. VW simply casts four iron cylinders, shrinks them on to steel inserts, and bolts them to a crankcase. The biggest user of magnesium in auto manufacture anywhere, VW makes not only the crankcase of this metal but the transmission and fan housing, as well.

None of the parts of the old and new engines are interchangeable.

All four speeds in the transmission are synchronized—as, indeed, they are now in the standard VW. This box is even more fun to shift than that of the four-speed Corvair. The stick is crisp, the throws short. The ratios in both cars are the same: 3.8, 2.06, 1.32, and .89.

The 1500 keeps its head in the corners. This reporter found it willing to take

book—and even comes in a swank station-wagon version



FRONT SUSPENSION features two-arm ball joints in place of the standard VW's kingpins. Instead of the latter's laminated torsion-bar springs, the new car has solid bars.

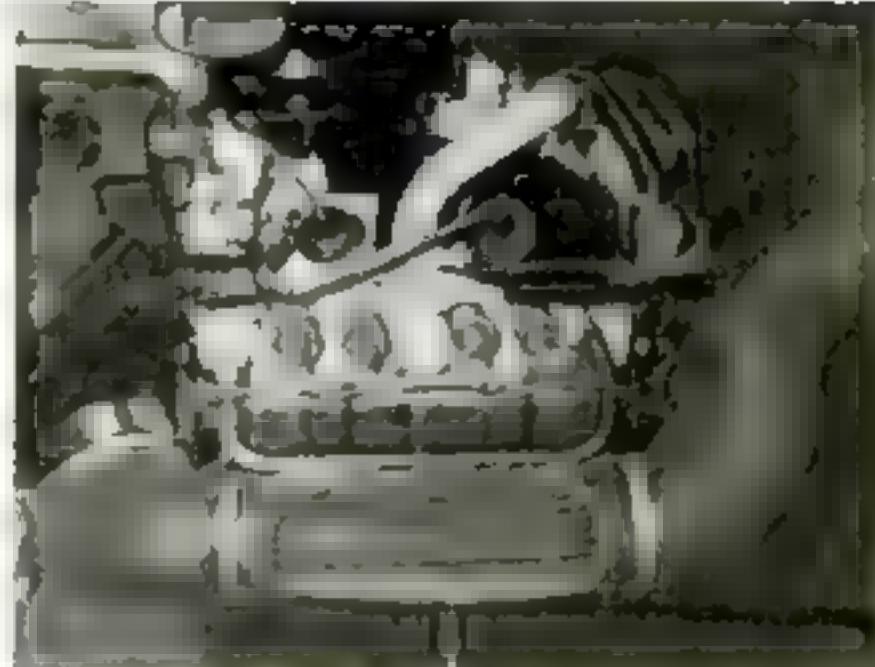
hairpin turns on the test track infield at 10 m.p.h. beyond posted speeds.

The ride is splendid. On a deeply ridged washboard road where an American compact car, thoughtfully provided by the VW people, shook off one's spectacles, the 1500 went through as if on skates.

The top speed is in the area of an indicated 133 kilometers (about 83 miles an hour), with the speedometer error three miles an hour on the high side. This compares with an indicated 70-72 in the standard VW.

The 1500 accelerates from a standing start to an indicated 100 kilometers an hour—62.5 m.p.h.—in 20 seconds, compared with 26.8 seconds for the standard VW. Performance, of course, costs money. The standard VW will go 100 kilometers on 7.5 liters of gasoline. The 1500 requires 9.5 liters or, roughly, a gallon for each 25 miles.

Volkswagen officialdom can get pretty



HEAT-EXCHANGER SYSTEM for warming passengers is depicted by this cutaway. Fresh air in semiclosed plumbing circuit is routed from blower, around exhaust, and into the car.

sticky about nomenclature in a discussion of the new car. The standard Volkswagen, for instance, is not "the old car." It's "the Volkswagen." The new car is the "VW 1500," using only the initials, not the spelled-out name.

"They are two different cars," explains a company officer earnestly.

Yes, they are. The VW 1500 was created for the same reason that there are Buicks a cut above Chevrolets and Cadillacs a cut above Buicks. The new Volkswagen—pardon, the VW 1500—is for the man getting up in the world, ready to burnish his status symbol.

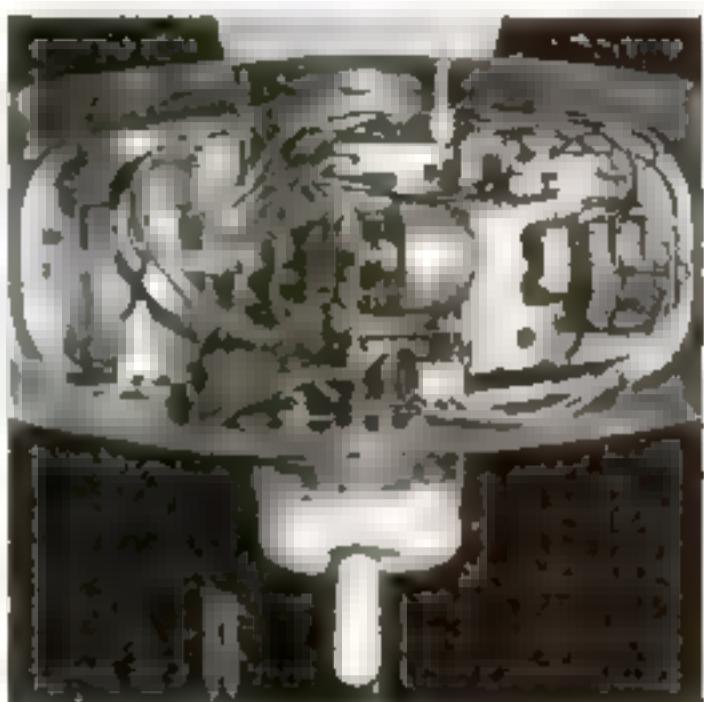
For the U. S. market, the 1500's conformance to contemporary styling may be self-defeating. Anyone can spot a Volkswagen a mile away. It has become a mark of distinction. Who wants to drive a car that can't be distinguished from an Opel, Simca, Ford Anglia, Taunus, or Hillman—or indeed, from a Falcon, Comet, Lark, Olds F-85, Tempest, or Valiant? ■ ■



REAR ENGINE in wagon, under floor like Corvair's, permits a cargo space 67 in. long and 48 wide over the wheel wells. One of car's engaging oddments is a cylinder in front compartment that, filled with compressed air, energizes windshield squirters.



◀ **CONTENTED CALF** doesn't miss mother. It gets half a pint of formula from the automatic feeder at left, can come back for more in four minutes.



COMPLEX MECHANISM behind cover includes hopper for powdered formula, thermostat-controlled water tank, and plunger to open and shut valves.

Mechanical mother down on the farm

A new calf feeder can do everything the cow does except moo. It uses four micro-switches worked by a cam to control relays, solenoids, and motors. In sequence, the mechanism dumps a preset amount of dry formula into a bowl, turns on a stir-

rer, fills the bowl with warm water, and triggers a check valve to a nipple. The calf's mother, released from baby tending, goes back on the assembly line to give milk for the dairy's customers. K & K Mfg., Minneapolis, makes Nurs-ette.



Cargo cage for station wagon

The grille in the station wagon above keeps cargo from sliding forward when brakes are applied. It can also confine a dog to the rear compartment. The welded grid stands on two base feet, is secured by wingnuts to the locking lugs for the folding rear seat. It was made by Robert Peters of Walton-on-Thames, England, for his Vauxhall Victor.



Underwater hydroplane

Towed by launch at speeds from 2 to 20 knots, this underwater craft lets a diver survey the sea bed at Port Adelaide, Australia. When the pilot is inside, the cockpit is closed. He gets air from a cylinder, observes through portholes, and can stay down four hours. Hydroplanes fore and aft are controlled from inside to submerge and level off at any depth.

New Ideas from the Inventors



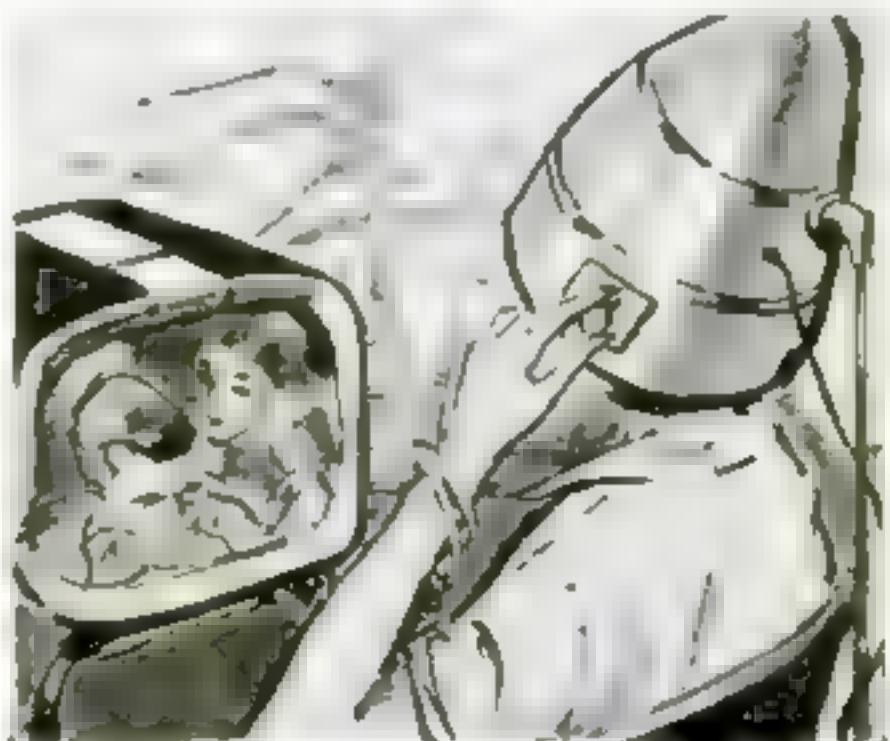
Machine Packs Your Groceries. Supermarket lines might move faster if checkouts were speeded by this recently patented bag packer. A conveyor would move your purchases along to the cashier.

Paper Spoon Peels Off Cup. You wouldn't have to carry spoons or stirrers to a picnic if you used containers like this for tea or coffee. A spoon-shaped cutout in the stiff outer layer of the paper cup would pull out like the conventional handle tabs, then break free.

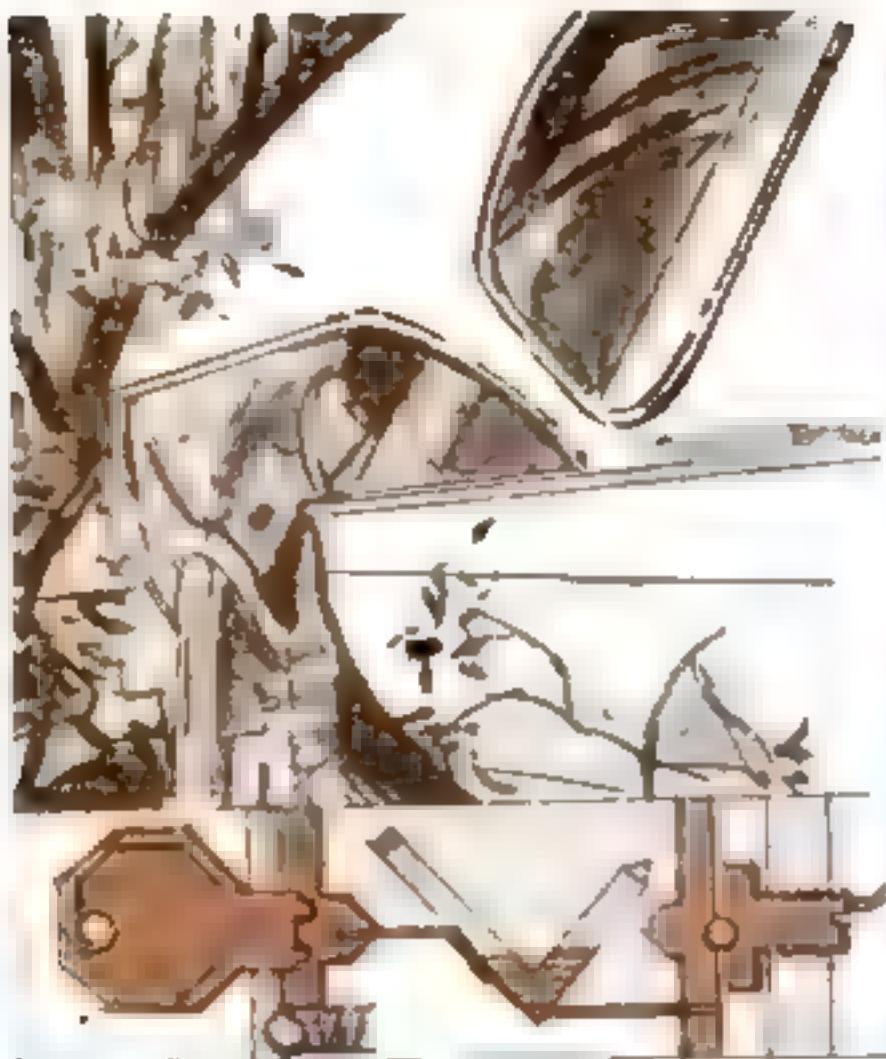


As he rang up each item, he'd place it in a well. The machine would then open and grip a paper bag, slide a load into it, tip it up, and move it forward so that another bag could take its place.

Dryer Pipes In TV Sound. A beauty-shop patron could hear music, TV sound, or her attendant's voice while she had her hair dried under a helmet like this. A small speaker would feed into the air space under the shell; each dryer would have its own selector and volume control.



More Inventors' Ideas



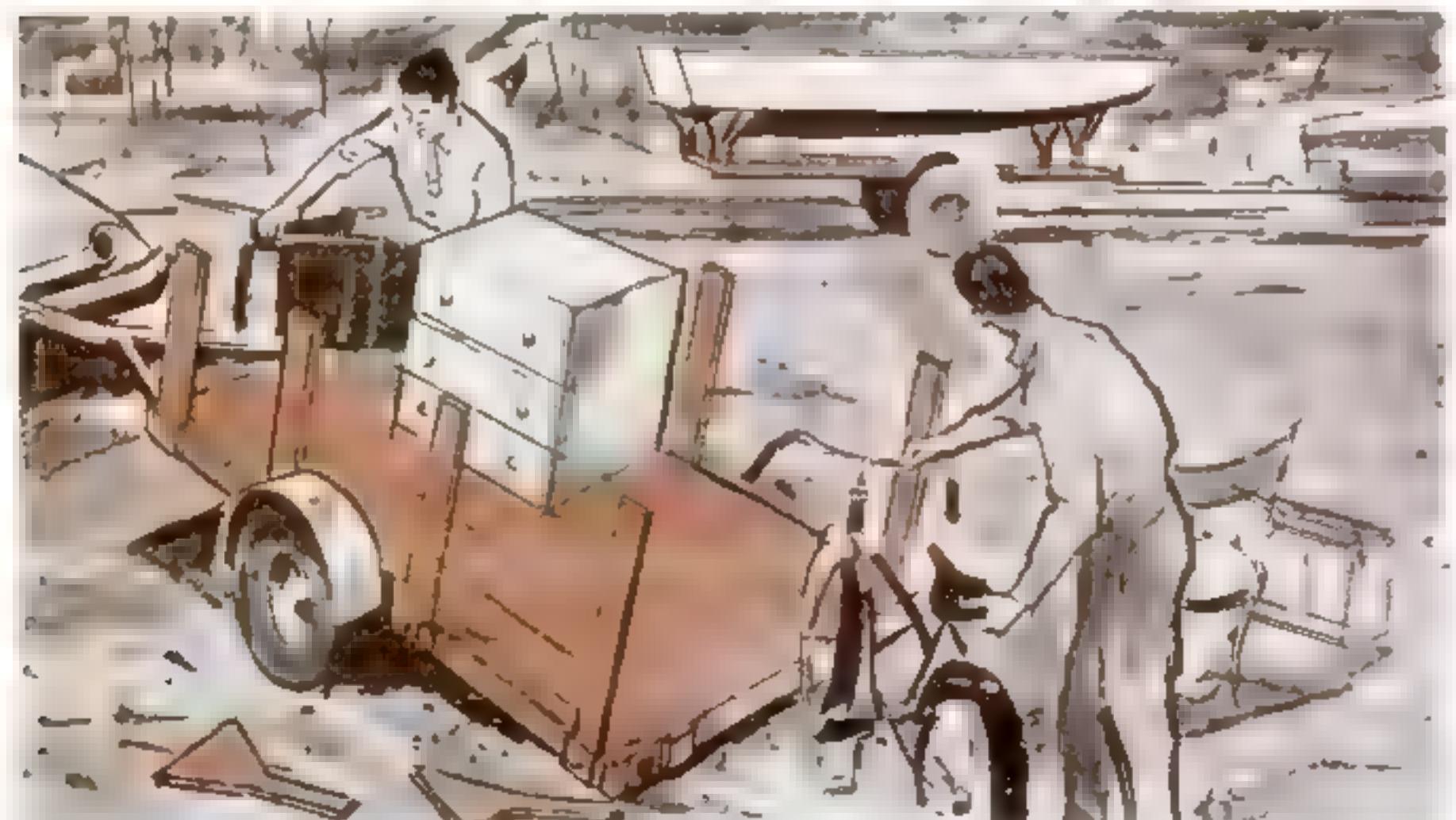
Tilt Switch Fights Car Fire. With electrical contact made through mercury in a V-shaped tube, this safety switch would automatically cut off the ignition if a car or other vehicle crashed, overturned, or tilted to an unsafe angle. The cut-off might prevent some fires, and help halt out-of-control cars.

Boat Trailer Carts Anything. You'd get all-year service out of a trailer like this. Y-shaped boat-support pads could be exchanged for side-wall stakes suited to



Tool Pockets Zip Onto Apron. You could switch more quickly from one job to another if you didn't have to reload your apron pockets each time. Here, instead of weighing yourself down with nails when you need small tools—or vice versa—you'd just zip off one set of pockets, as shown, and zip on another.

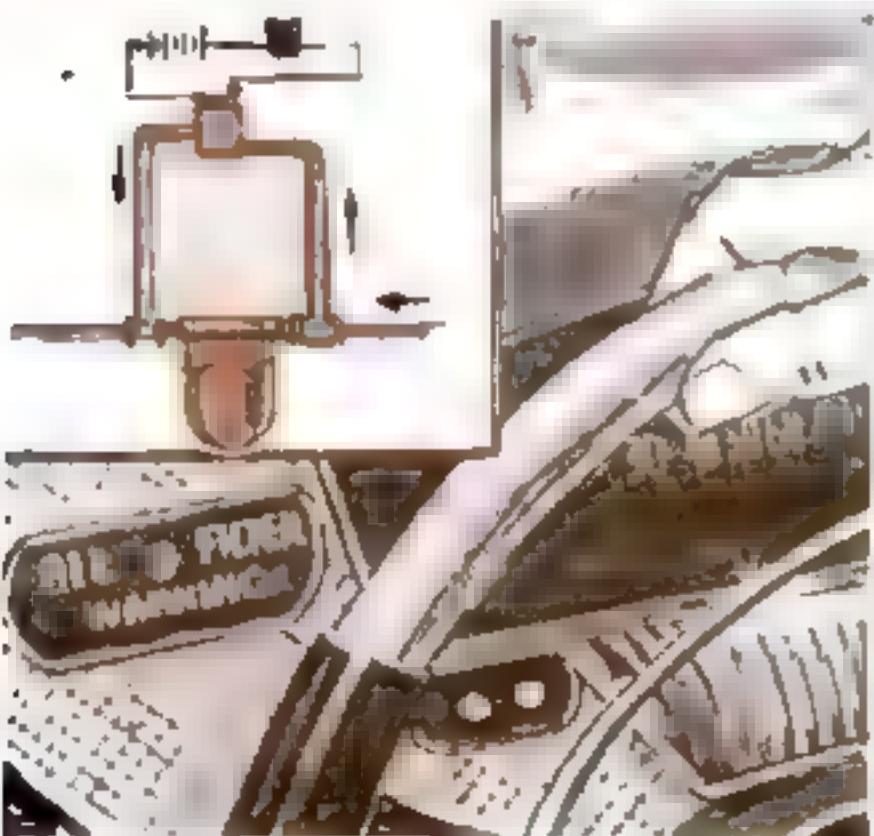
different kinds of hauling. They'd slip in or out of brackets. A winch in the hitch would let you tilt the trailer bed to provide easier loading, too.





Cop's Billy Lights His Way. With a bulb and battery built into this club, a guard or policeman could use it to shed light or to signal for help while still keeping it handy as a weapon. One version would include a hook to grip a suspect's collar, and a transformer to give him a shock if he tried to get away.

Filter Shows If It's Filtering. You'd know when your car's oil filter needed cleaning or replacement if it were monitored by an indicator like this one. When the relief valve opened to let oil bypass a clogged filter, lowered pressure across the line would allow a switch to close and light—or sound—a signal.



"Air" Spray Chokes Fire. This inventor would suffocate flames with inert gas instead of water. A burner would remove half or more of the oxygen from in-drawn air and pump the carbon-dioxide-rich exhaust through hose. The spray would eliminate water damage and drive away smoke so firemen could breathe.

The following patents have been issued on three inventions:
Ban Packer No. 2,946,399 to W. A. Herker, Box 613 Hopatcong, N. J., **Spoon**—No. 2,86,363 to H. B. La Tourette, Jr., Clayton, Mo., **Dryer**—No. 2,966,550 to J. Goldberg and E. Goldstein, Chicago, **Switch**—No. 2,810,489 to G. L. Fahlgren Crockett, Calif. **Apron**—No. 2,816,485 to W. L. Ehrlich, Champaign, Ill., **Trailer**—No. 2,881,438 to Henry Huber, DeLand, Fla., **Billy**—No. 2,966,621 to S. T. Folt, Great Falls, Mont., **Filter**—No. 2,843,077 to B. Leifer, Silver Spring, Md., **Spray**—No. 2,961,010 to C. D. Macfadden, Tenafly, N. J.

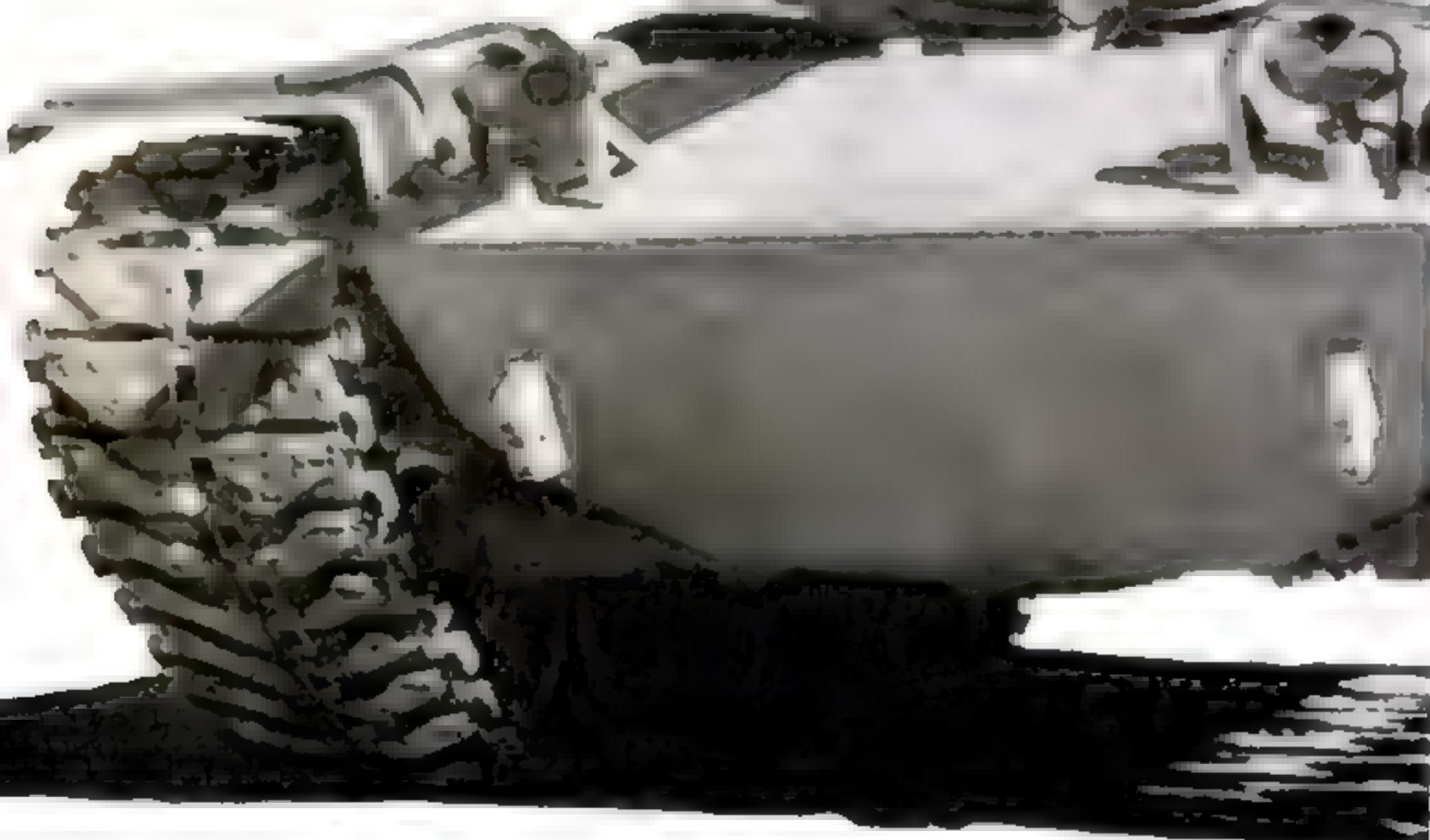
Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D. C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

**I drove the Army's new
50-ton killer:**

M60 The World's Toughest Tank

By Erik Miller

LIKE BOATS in a choppy sea, M60
fleet bobs across wilderness.



YOUR first glimpse of the squat M60 tank tells you it's hardly designed to take the kids for a Sunday drive. Every big, brutal line, from the dirt-encrusted tracks to the wickedly long high-velocity gun, is strictly business.

You walk around it once, remembering the briefing they gave you—more fire-power, more range, new black boxes,

much better crew protection. It's a fighting machine that is replacing the M48 as our No. 1 battle tank. It can clobber any other tank in the world, they told you.

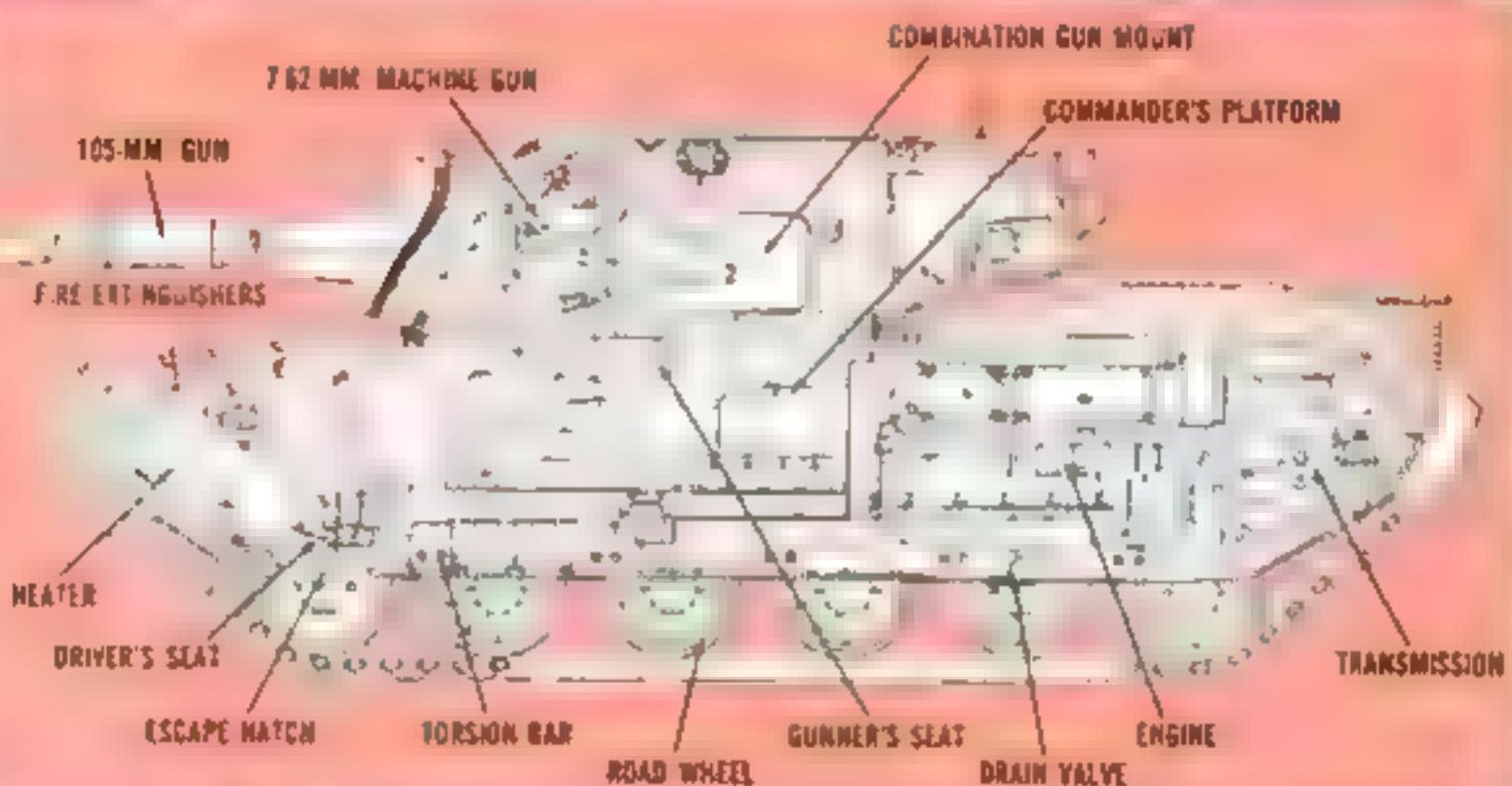
The tank commander, who has been watching you while the M60's awesome looks sink in, asks you if you're ready to roll it. You hoist yourself onto the brown hull, past the queer ports and grilles,



IN THE MIDST OF AN ARSENAL, the driver's seat is under the cannon and flanked by amino racks. Controls are surprisingly uncomplicated. Transmission stick follows stepped pattern: far front to start, two forward speeds, and reverse. Above the wheel are tachometer (left) and speedometer (right).



GUNNER'S-EYE VIEW shows open breech of main armament: a British-built, quick-firing 105-mm. cannon. Large plate at right is counterbalance. Tubes below, toward driver's seat, are a few of the M60's 57 shell containers.



COMPARTMENTS FOR CREW OF FOUR—commander, driver, and two gunners—are dovetailed into design for maximum compactness and protection. Unlike gasoline-engine tank it replaces, the M60 needs no "little Joe" auxiliary engine to power radio, lights, and gun-turret rotation. Its supercharged V-12 diesel does it all.

and onto the gun turret. Before swinging down the hatch you glance around at the chewed-up testing ground. This terrain would turn an auto into a bent ruin.

The first footing is the commander's platform below the hatch. You wriggle past and down to the driver's seat. It is a wire-mesh affair that sags comfortably. Somehow you'd always thought that a

tank would have more knobs than a pipe organ, but this is different. You're in a little, white-painted steel room, with only a modest number of levers and gauges to manage. The springy seat is a two-level job, locking upward for heads-out driving and downward for periscope travel if people with ugly dispositions are around. To your right a shift rod sprouts



HUGE DISPLACEMENT (1,790 cu. in.) of diesel helps it put out the 750 hp. needed to hustle 51 tons at a top speed of 30 m.p.h. Although the powerhouse gulps a gallon of fuel for every .85 mile over flat terrain, the 375-gallon tank assures a cruising range of 320 miles. Two top-mounted axial-flow blowers ram 20,000 cubic feet of cooling air per minute into the engine compartment.

from a quadrant to give you two forward gears and reverse. There's no clutch—just an accelerator and brake pedal. You steer with an airplane control wheel. The tank commander needs only moments to brief you on driving.

Work the starter (it's linked with the shift lever). A deep throbbing noise aft tells you that the mammoth 750-hp. diesel has caught. You check the gauges, slip into gear, step lightly on the accelerator.

The big steel beast takes off smoothly, the slapping of the track blending with the chest-punching throb of your supercharged V-12 engine. A whiff of diesel smell drifts into your compartment, and there's a taste of hot metal. Although the ground rolling toward you is rough, the torsion bars on the track wheels translate it into a curiously gentle rocking or pitching motion.

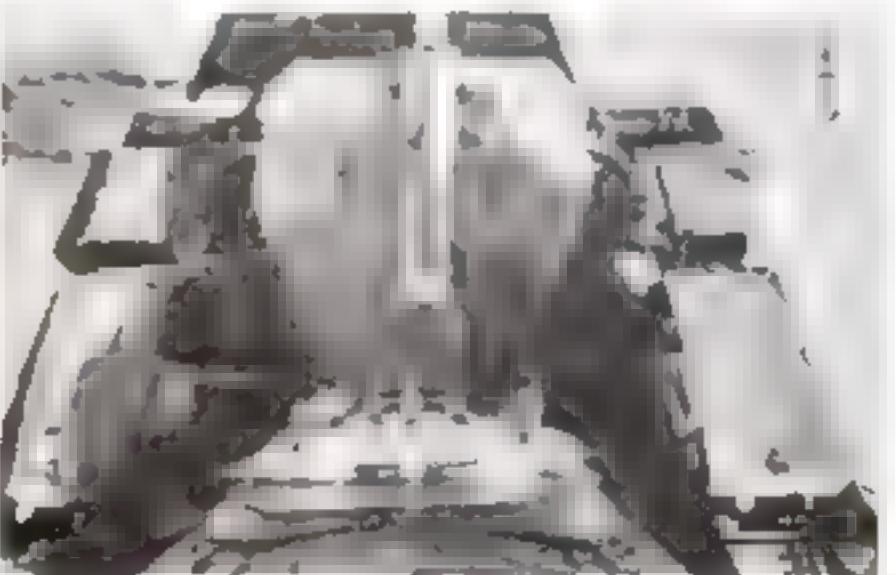
You experiment with the steering wheel, which works by changing the power ratios between the two tracks. If you turn it too far or too fast, there's a hard sideways slam. You get the knack of wheeling the tank where you want it with smaller corrections, getting jerks rather than slams.

Coming around back to the starting place, you tackle some steep little hills. Going up slopes so steep you wonder if you might topple backward, you note that there's power to spare—from a geared-down engine having a whopping 1,710 foot-pounds of torque. Going down, you just touch the pedal and a stack of 18-inch disk brakes, oil-cooled and powerful, haul you down to a smooth stop.

You cut the engine, squirm into the open, and drop to the ground. Then you walk around the awesome M60 again, glad that this killer is on our side. ■ ■



ARMOR-PLATED UNDERBELLY is pierced by waterproof hatches for emergency exit. Tank-width torsion bars, attached to wheels by bell cranks, are sealed where they enter the body. Ground clearance is 1½ feet. The M60 can plow through four feet of water, jump an 8½-foot trench, and squeeze down an alley only 12 feet wide.



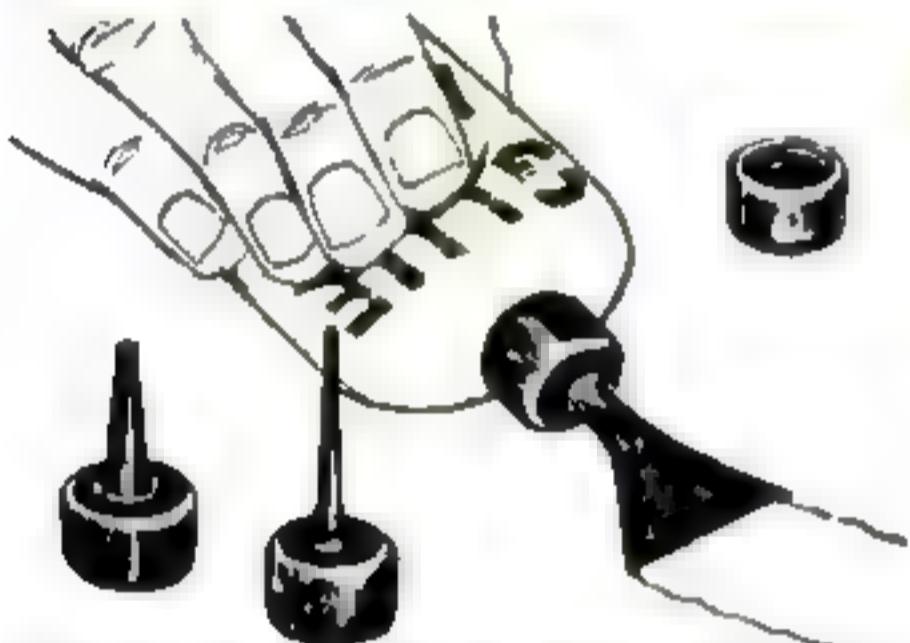
IN TRAIL POSITION, cannon rides over stern-mounted engine. Enlarged section of barrel is sleeve covering recoil-suppressing ports and gas evacuator. Heavy grilles over the engine air intakes are flanked by toolboxes. Telephone in the small box at left rear permits foot soldiers to talk with the crew, sealed inside.

"I'd like to see them make..."



DOUBLE-LIFE SHIPPING CARTONS for gas-station supplies. Preprinted with signs in fluorescent

ink, they could be given to customers when empty.—A. J. Preuss, Campbell, Calif.



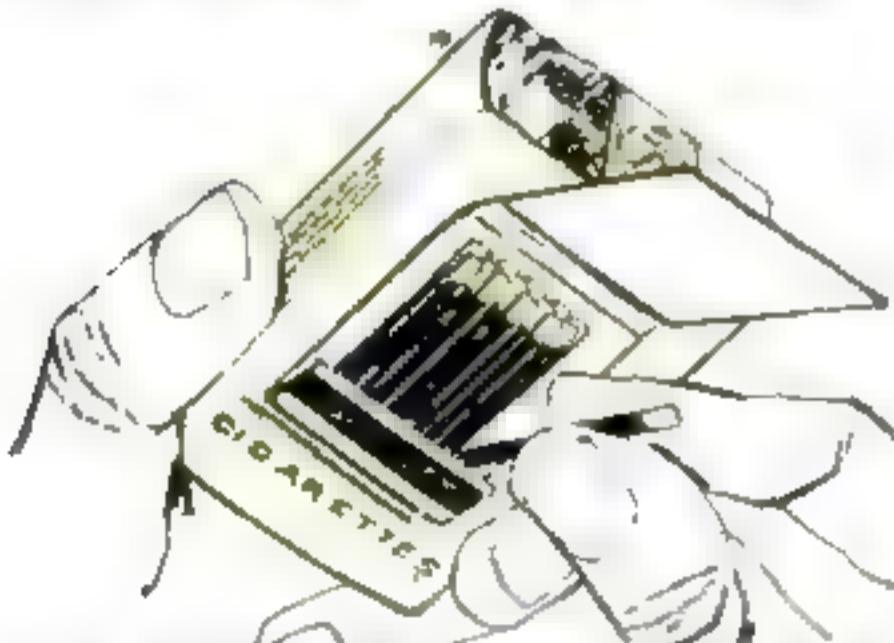
CHANGEABLE GLUE SPOUTS for squeeze bottles. One wide-spread, one needle-nosed, and one regular would take care of a variety of jobs.

—Terry Dawson, Manhattan Beach, Calif.

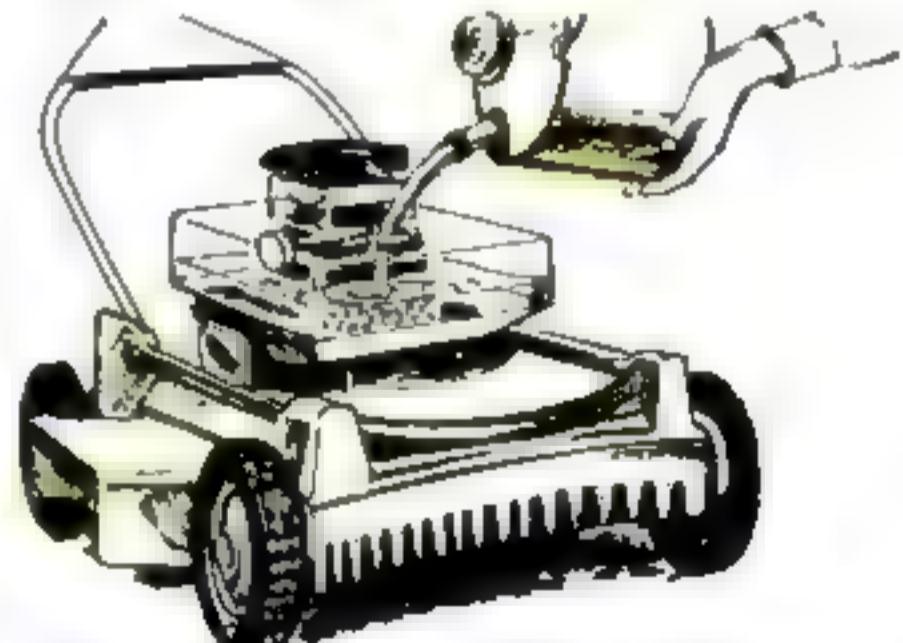


SOCKET-WRENCH EXTENSIONS with knurled ends to permit easy spin-off of loosened nuts, even though the tool and your hands might be oily.

—J. I. Mitchell, Horseheads, N.Y.



BOOK MATCHES with pressure adhesive on the back. Then you could stick the folder to the cigarette package and it would never be mislaid.—Clarence Brady, San Fernando, Calif.



TRANSPARENT FUEL TANKS on power lawn mowers so you could tell at a glance how much gas you had left instead of running dry in the middle of the lawn.—Sam Gainer, Austin, Tex.

Everyone has his own pet idea of a gadget that he would like to see in general use. What's yours? We will pay \$5 for each one published. Please use Government postcards

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Text and drawings by **Edwin Tunis** Author of *Weapons: A Pictorial History*

AS FAR back as 1784 Benjamin Franklin envisioned an aerial invasion by soldiers wafted into enemy territory in 5,000 balloons. French Republican forces used a captive observation balloon to help them defeat the Austrian army at the Battle of Fleurus, June 26, 1794. In this first effort, the observer dropped weighted notes to convey information to the French commanders. After that, military aeronautics was little more than talk until the American Civil War.

On July 31, 1861, less than four months after the fall of Fort Sumter, John La Mountain made the first effective war use of an observation balloon in this country near Fortress Monroe, at the mouth of the James River. At that time James Allen and John Wise also had balloons in the field from which they subsequently made useful observations. All three were professional showmen using their own balloons. But these, too lightly constructed to stand much military use, were soon destroyed by accident or by the inexperienced handling of soldier ground crews.

Professor Thaddeus Sobieski Constantine Lowe was also a civilian with his own balloon, the Enterprise, well named to match its owner's character. Lowe was determined to head an organized army balloon corps. He landed the job after a demonstration in Washington, during which he dispatched a telegram (the first ever sent from aloft) to President Lincoln over a thin wire hanging from the "car" to the ground. Still in the air, the Professor was then towed to the south lawn of the White House, where he descended.

The title "Professor" wasn't the result of any college degree, nor was there anything derisive about it. Lowe was a highly respected man of intelligence, energy, and executive ability, as well as a man of

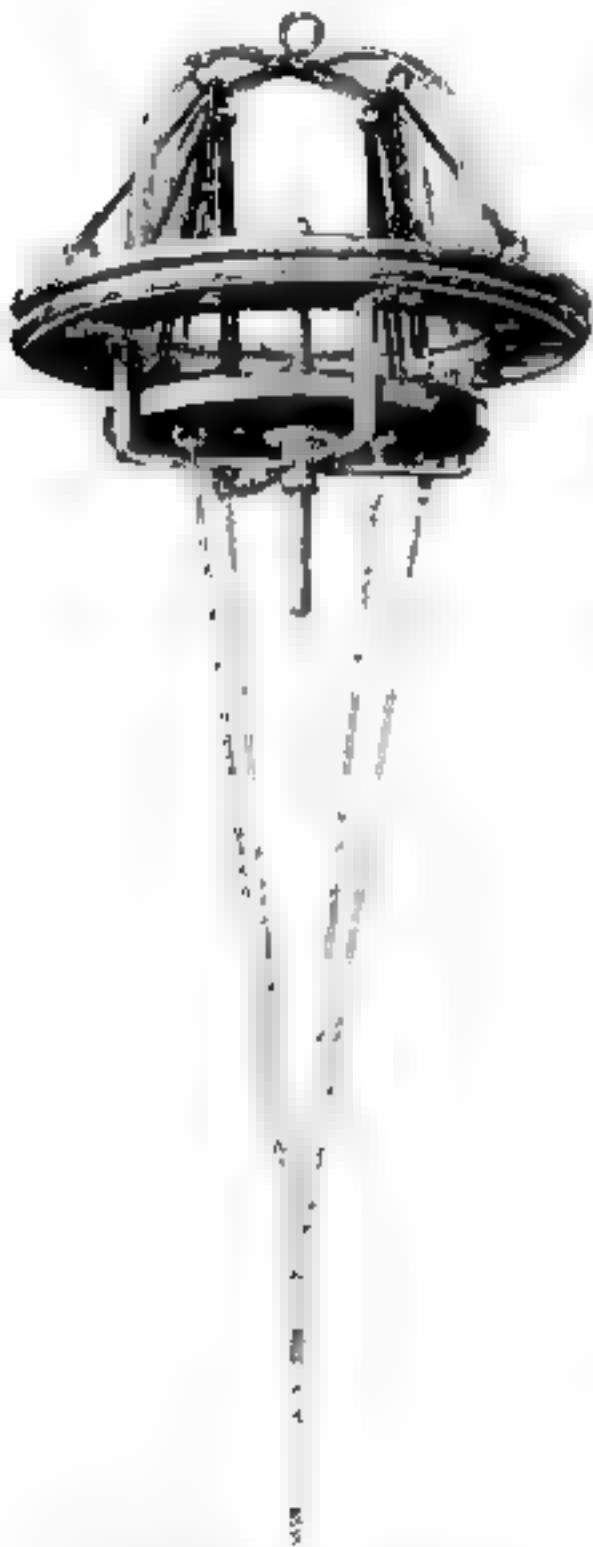
great courage. He knew that a showman's balloon wouldn't do for army work and he so persuaded the generals, who authorized him to build one, to be named the Union, of the best India silk, with linen rigging and cordage. With the help of 50 seamstresses, Lowe turned 1,200 yards of pongee into a balloon in 16 days.

In the intervals between active work as balloonist and observer, Professor Lowe designed and supervised the building of seven military balloons. They varied in size from the Union and Intrepid, each holding 32,000 cubic feet of gas, and able to lift five men, to the Eagle and Excelsior of 15,000 cubic feet, which could carry only one. Although the larger ones had more than twice the cubage of the smaller ones, the difference in size was curiously slight. The diameter of the Intrepid was 38 feet, that of the Eagle only eight feet less. The small balloons were spherical; the larger ones were top-shaped. The outside of the envelope was "doped" with four coats of boiled linseed oil, to make it gastight, and the whole thing was then turned inside-out (what a job!) for a coat of neat's-foot oil to keep it pliable.

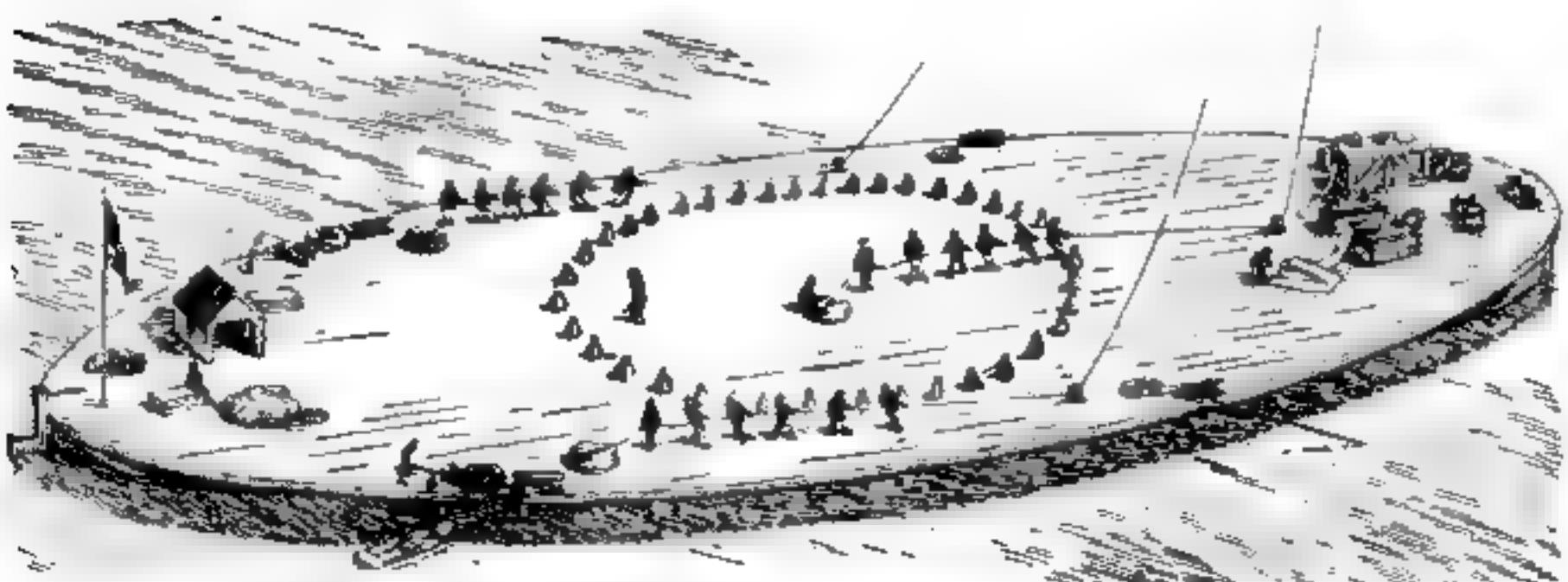
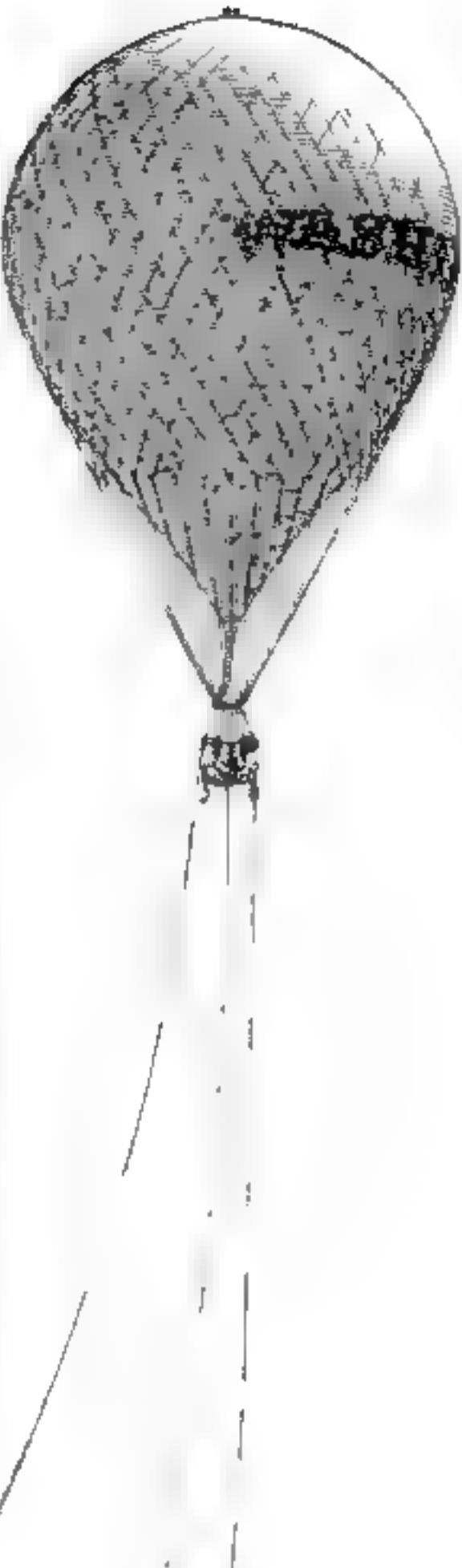
A large wooden valve for discharging gas at need was fitted into a reinforced circular hole in the top of the gas bag. The valve-control rope passed down through the center of the envelope and emerged from the dangling snout through which the balloon was filled with gas. The bottom of this snout remained open so condensed moisture could run out and pressure from absorbed heat could be relieved; except under such pressure, the light gas would not escape downward.

A net of strong linen cords enclosed the envelope and transferred its lift to the gondola. The cord ends reached down to a strong wooden "concentration ring"

PROFESSOR LOWE'S "BALLOON BOAT," the U.S.S. G. W. Parke Custis, began life as a coal barge. Although she had no means of moving under her own power, she must be counted as the world's first regularly commissioned aircraft carrier. The Professor built an overhanging flight deck on her, big enough to permit handling a balloon and with room to spare for two hydrogen-gas generators. A ring of sandbags restrained the balloon when it was not in use. Pulleys bolted to the deck helped to hold its guy ropes when it was aloft. The Custis was 122 feet long. She saw active service on the upper and lower Potomac River in the fall of 1861, and in the Peninsula campaign in the spring of 1862.



MAHOGANY VALVE from the top of Lowe's balloon Enterprise is shown open at left. This device was normally used for descent at the end of a free flight; in captive flight it was seldom touched. The control cord passed through the middle of the balloon and its lower end was within reach of the aeronaut. With it he pulled the central disk down, making an opening to release gas and so reduce buoyancy. Releasing the cord allowed the "India-rubber springs" to close the valve again. The crevice between valve and seat was calked with a thick "goop" of soap and wax. (These and other details have been provided by F. Stanbury Haydon's *Aeronautics in the Union and Confederate Armies*, Johns Hopkins Press, 1941.)



Civil War aeronauts 1,000 feet up could see the enemy

placed well below the envelope. The basket in which balloonist and passengers rode hung from this ring by stout lines spread by a ring placed at about head height from the floor of the basket. The basket itself was woven of willow withes, or of rattan on a willow frame. It was rectangular and flat-bottomed, with sides only two feet high. These "cars" were either painted blue and decorated with white stars, or had red and white stripes painted below a star-spangled blue band. The envelope was decorated, too. If all this seems unmilitary, it was at least stylish at the time.

Handling and observation

In addition to the aeronaut, the telegraphers with their five miles of wire, and the transport men to handle seven or eight four-horse wagons, 33 soldiers were assigned to handle the balloon itself. This made quite an encampment, usually in a hollow, or behind a screen of trees, that would hide their big ball and protect it from strong winds. When inflated but not in use, the balloon was held down by 30 or 40 100-pound sandbags attached to its cordage, as well as by its guy ropes secured to trees or to iron grappling hooks. During inflation it rested on straw or a ground cloth.

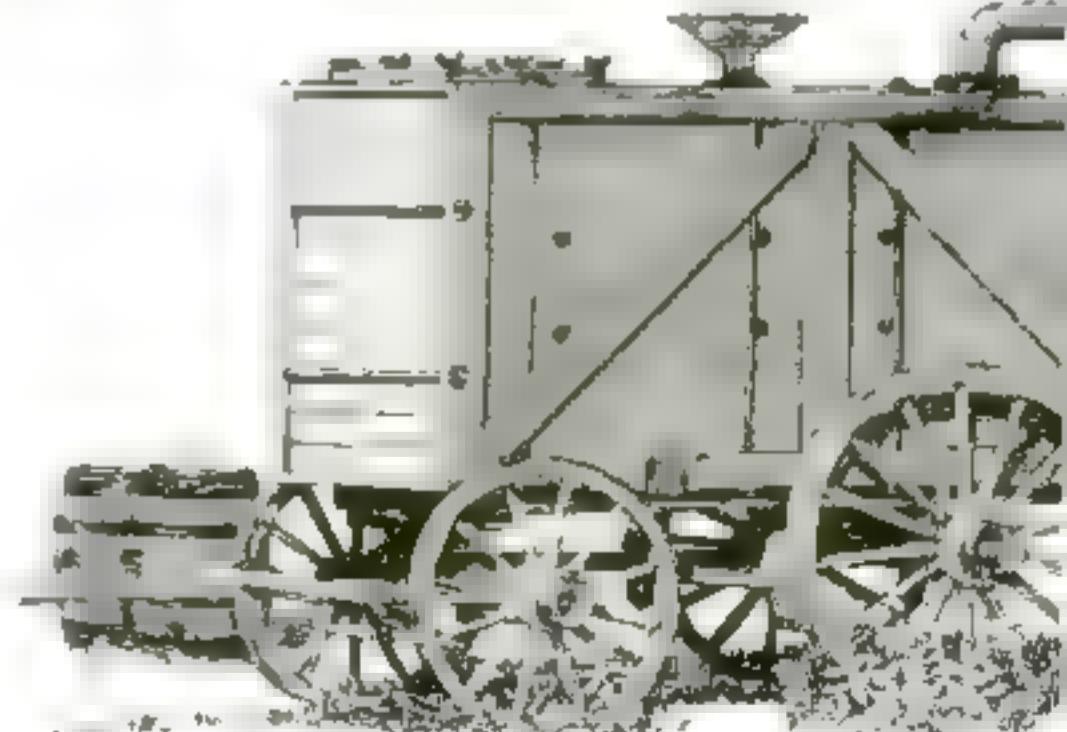
Ascensions were not made from the camp area but from a cleared space a little distance off to which the soldiers towed the balloon by hand. This was to save the camp from the Rebel artillery fire that an ascension always drew. At observation height the aeronaut was beyond range, but he had to pass through lower levels where the Confederates threw everything they had at him. Though Southern newspapers reported imaginary hits, and though there were dozens of hair-raising near misses, including shells that passed through the rigging, no balloon was ever hit by a shell, or indeed anything bigger than a musket ball.

The largest craft were restrained by as many as four Manila cables, hanging from the spreader ring, with the ground end of each run through a pulley and handled by a six- or eight-man team. When the observer reached working height, grappling hooks on the line ends could be anchored in the ground to hold him there. Balloons were sometimes towed considerable distances while at observation altitude; Professor Lowe was once moved 20 miles in this way. Most ascensions went up from solid earth, but quite a few took off from boats—either ordinary gunboats, or the G. W. Parke

BALLOONS CAN RISE when inflated with ordinary illuminating gas; the Confederates used it in the one rather touching patchwork envelope they made from silk dresses contributed by Southern women. But hydrogen has the greatest known lifting power. Thaddeus Lowe designed a portable hydrogen generator that completely freed Union Army balloons from city gas mains. The generator itself was a wooden box 11 feet long, 5 feet high, and about 3 feet wide, narrow enough to ride on an army transport wagon. A second wagon carried the necessary auxiliary parts.

The generator box was strongly built, braced to stand gas pressure, and acidproofed inside. Access to the interior was through a manhole in the top and a clean-out door in the rear wall, both tightly bolted down when gas was being made. Shelves on the inner walls held 3,300 pounds of iron filings, submerged in three feet of water. Sixteen hundred pounds of sulfuric acid was slowly added to the water through a copper funnel. As the acid attacked the iron, hydrogen gas formed and was drawn off in a six-inch hose to the cooler. This was a box some five feet long with a smaller, though higher, box inverted in it. Enough water was

put in to fill the inner box about half full. Incoming gas entered the inner box under water and bubbled upward around baffles to leave through a second hose attached flush with the box top. Through this the gas passed to the purifier, a duplicate of the cooler, but filled



for 20 miles—and stay out of range of artillery fire

Custis, which was planned for the operation.

One balloon made an accidental free flight over Rebel territory and got away with it, but normally a stationary position 500 to 1,000 feet up was best for military observation. At 1,000 feet an observer could see up to 20 miles with field glasses, and he remained in constant communication with the ground. In the larger balloons a telegrapher was standard equipment, and engineer officers often went up as passengers to map the country below.

The aeronaut wasn't a trained soldier (not even Lowe held any military rank); still he and his half-dozen subordinate balloonists became expert at discovering and interpreting enemy activity—though they could also be misled. They could spot artillery; but the Rebels could fool them with wooden "Quaker" guns. They could count campfires at night; but they couldn't distinguish them from dummy fires lighted to deceive them. Still, the dust of moving columns was unmistakable, as was the blue-and-white smoke of gunfire.

Just as airplanes have been used in later wars to observe the effect of artillery fire and correct the aim, balloons were used for this purpose at times in the

Civil War. The balloon had one point of superiority over the plane: Its observer could hear the blowing of bugles, the shouting of men, and the rattle of gunfire. There was talk in Civil War times of the military advantages of photography from balloons, but no example seems to have survived and there is no evidence it was ever tried. ■ ■

with a lime-and-water solution to absorb unwanted gases that were byproducts of the chemical action. Here, though, the gas, which entered by a six-inch hose, left by a twelve-inch one to go into the balloon.

The generator took three hours to fill a large balloon. Lowe had no way of storing gas, though he once met an emergency by transferring some from a small balloon to hasten the inflation of a large one.





TWO-PIECE METAL TOP for formal use has polished black rear section, brushed finish at

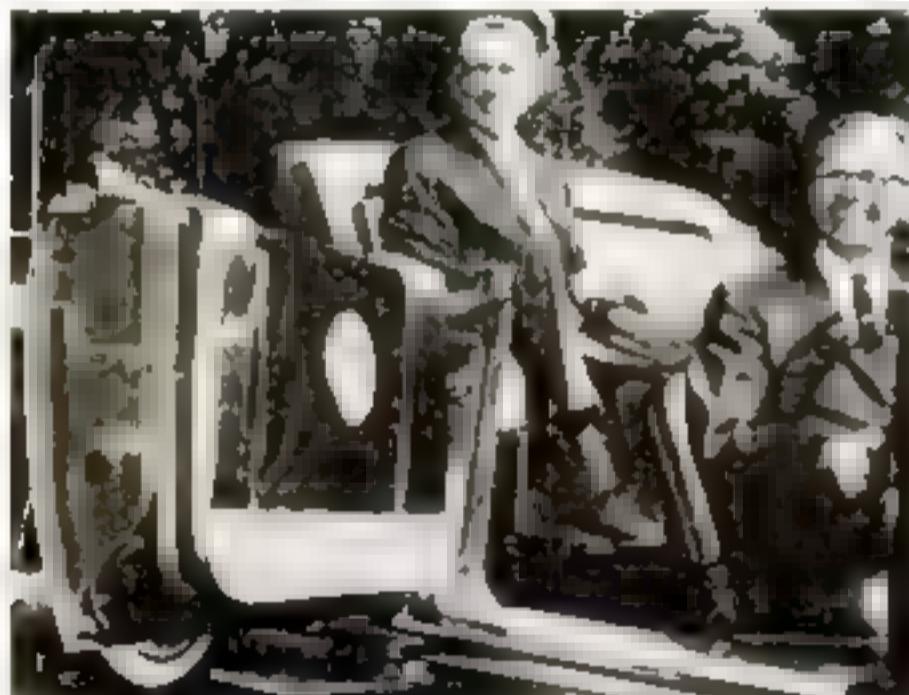
front. Exterior and interior are navy blue that looks black at night. The trim is light blue.

The President gets a new car

The new Lincoln Continental delivered to President Kennedy this summer has so many pushbuttons that it takes a special panel on the dash for them all. The car took four years to design and build

by Ford in cooperation with the Secret Service. It will be used for parades and other official purposes.

The car has three interchangeable tops: all metal, transparent plastic, and con-



ELEVATOR REAR SEAT rises 10½ inches on push-button power so President can see and be seen when crowds line streets. Footrest goes up with it. Jump seat is at normal height.



VIEW OF INTERIOR shows rear seat wide enough for three adults. Control panel at left contains reading lamp, radio, and seat-elevator switches. Lap robes fold into recessed doors.



90 POPULAR SCIENCE SEPTEMBER 1961

Floating two-story hotel

A 100-foot houseboat that once did duty as a dormitory for construction crews on a TVA project is being converted into a "boatel" on Lake Chickamauga near Chattanooga, Tenn. It will contain a grocery store and restaurant for boaters and campers, a top-deck dance floor and sun porch, and 14 bedrooms for guests.

The 280-ton boat was moved from Florence, Ala., by two 80-hp. outboards, making the 216-mile trip on the Tennessee in five days. Workmen completed renovations during transit.



PLASTIC TOP is transparent so President can be seen in parades but keep dry in rain. Third

vertible. The latter two can be stored in the trunk when not in use.

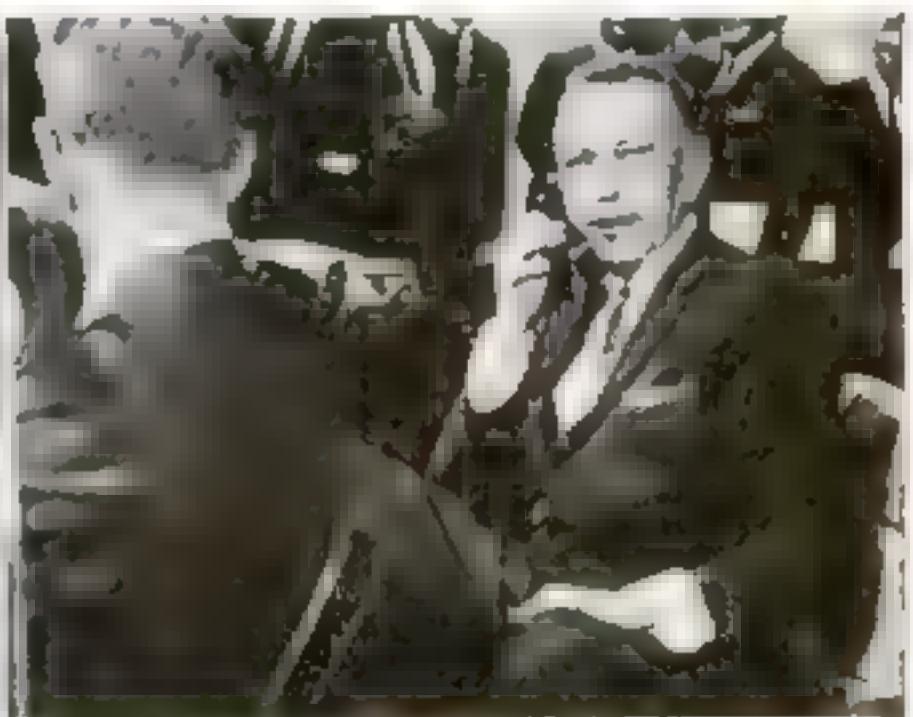
An elevator back seat can be raised $10\frac{1}{2}$ inches by pushbutton so the President can be seen by crowds. The compartment can be closed off from the front seat by a pushbutton sliding panel and has a handrail the President can grasp

interchangeable roof is convertible fabric. They are stored in trunk when not in use.

while standing. It has two two-way radio telephones, one fitted with a scrambler. There are separate air conditioners and heaters in front and back. The car is an elongated 1961 Continental, 253.7 inches in length (41.3 inches longer than the standard) and has a 156-inch wheelbase (33 inches longer). It weighs 7,822 pounds.



RETRACTABLE FOOT-STANDS and recessed hand-holds in body (two on each side) are for Secret Service men. Two more built into rear bumper have grips that can be mounted on trunk.



TWO RADIO TELEPHONES keep President in touch with country's business. One has a scrambler for confidential calls. Above, Secret Service chief U. E. Baughman checks phone.



Big flying boat scoops 7,000 gallons from lake . . .

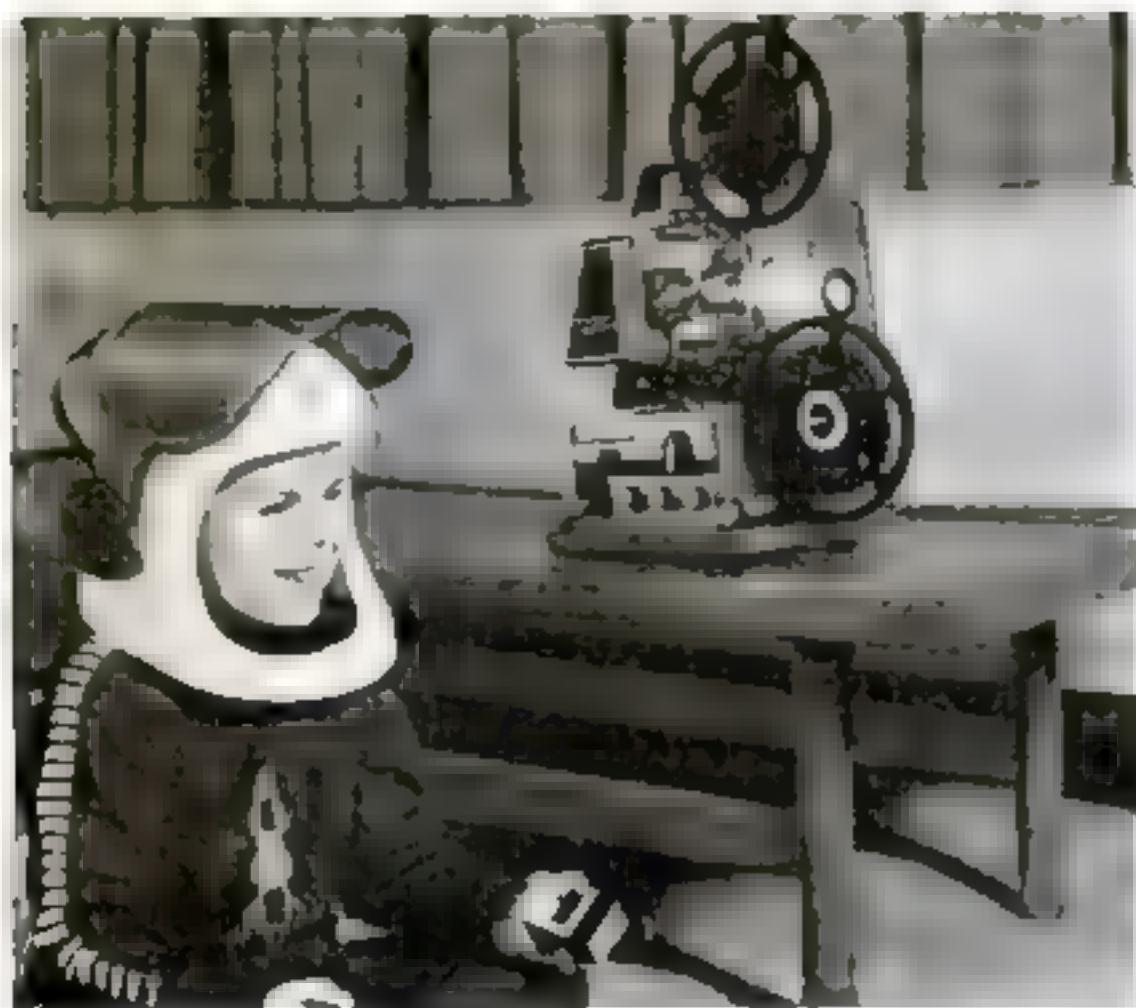
Huge aerial fire fighter

Three giant Martin Mars flying boats are being converted by a group of Canadian lumber companies to combat seasonal fires in the immense forests of British Columbia. Each is equipped with two 3,500-gallon tanks into which it can scoop water from a lake. Speeding to flaming woods, it can dump a third of an inch on an acre of ground every 15 minutes.



. . . dumps it on blazing forest.

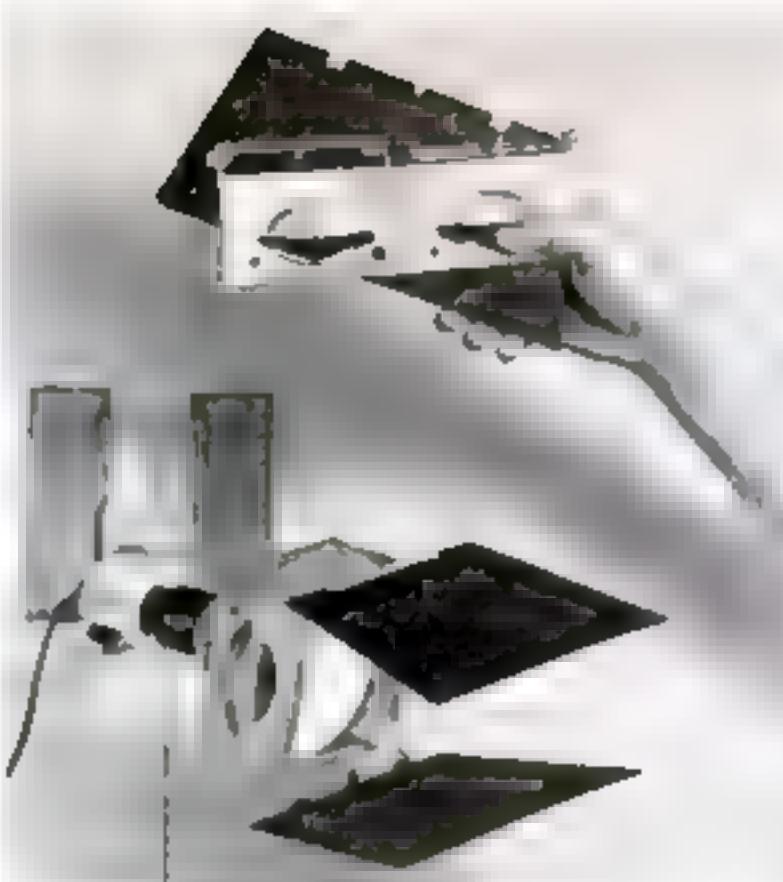
WHAT'S NEW IN PHOTOGRAPHY



Ultrasonic Projector

No cord to trip over is the latest refinement in remote-control projectors. This one does all an earlier model did with wires (PS, Mar. '61). It threads the film, turns off the room light, starts the projector, reverses, arrests action, varies speed, stops the show, and turns the room light back on. You push buttons on a transmitter to send ultrasonic waves to a receiver in the projector and trigger operation.

Two models: a Tele-Sonic movie projector sells for \$299.95; a Tele-Sonic slide projector for \$269.95. Bell & Howell, 7100 McCormick Rd., Chicago.

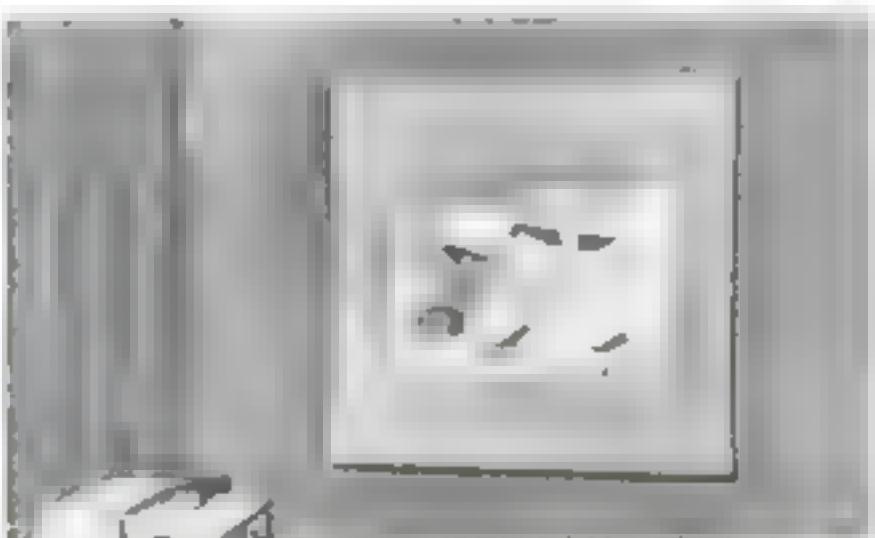


BARNDOR LIGHT
fits around an R40 reflector bulb in a clamp-on fixture to help you put light where you want it.

Pressed-in "eyes" in four sides are shaped to the contour of the bulb and slip on without taking it from the socket. Big 5-by-10-inch flaps swing back 270 degrees or come off so you can fold the device flat. \$5.75. Lowell Light Photo Engineering, 421 W. 54 St., NYC.



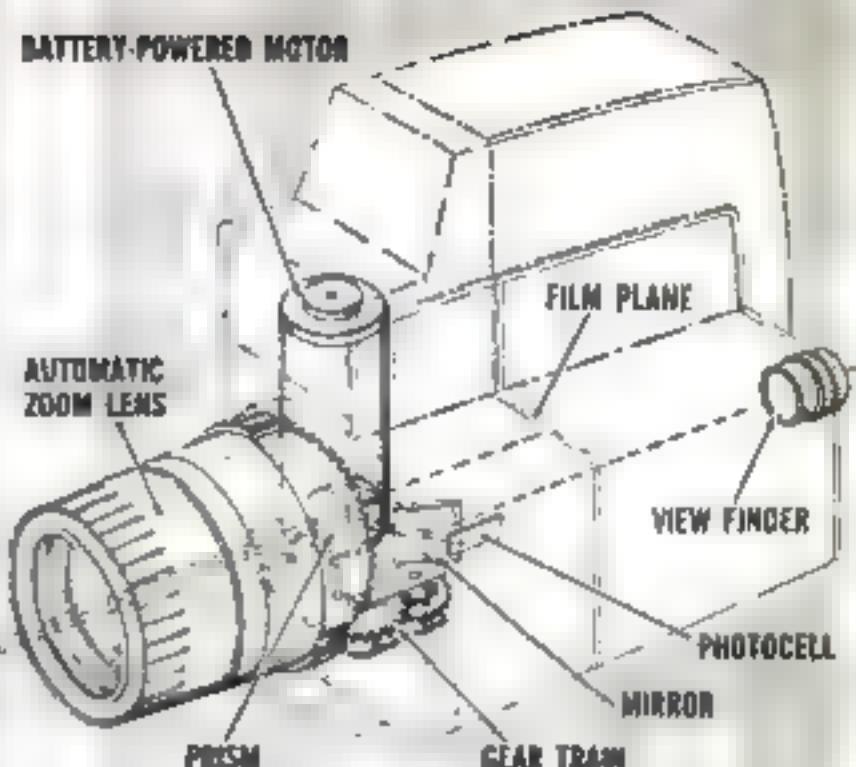
GAS CAMERA is powered by a CO₂ cartridge of the kind used in siphon bottles. Carbon dioxide operates a motor that advances the film and cocks the shutter. One charge is enough for six to eight 20-exposure rolls. The lens is fixed; you focus by moving the film. The 35-mm. Graphic Jet costs about \$120. Graflex, Inc., Rochester, N. Y.



PROJECTION SCREEN is made of embossed material resembling beaded plastic to give bright, glare-free reflection. The 40-by-40-inch screen weighs only 14 ounces with its container, is so light you can hang it on a picture hook. Sparklescope screen costs \$3.98. Central States Paper & Bag Co., 5221 Natural Bridge, St. Louis, Mo.



THROUGH-LENS CONTROL lets you focus and see the exact picture this 8-mm. movie camera is taking. It also sets the exposure, sensing only light that falls on the film. The system works



through a prism behind the lens, mirror, and photocell. The camera has two-speed electric zoom. Roll-film model, \$349.95; magazine-load, \$369.95. Bell & Howell, 7100 McCormick Rd., Chicago.



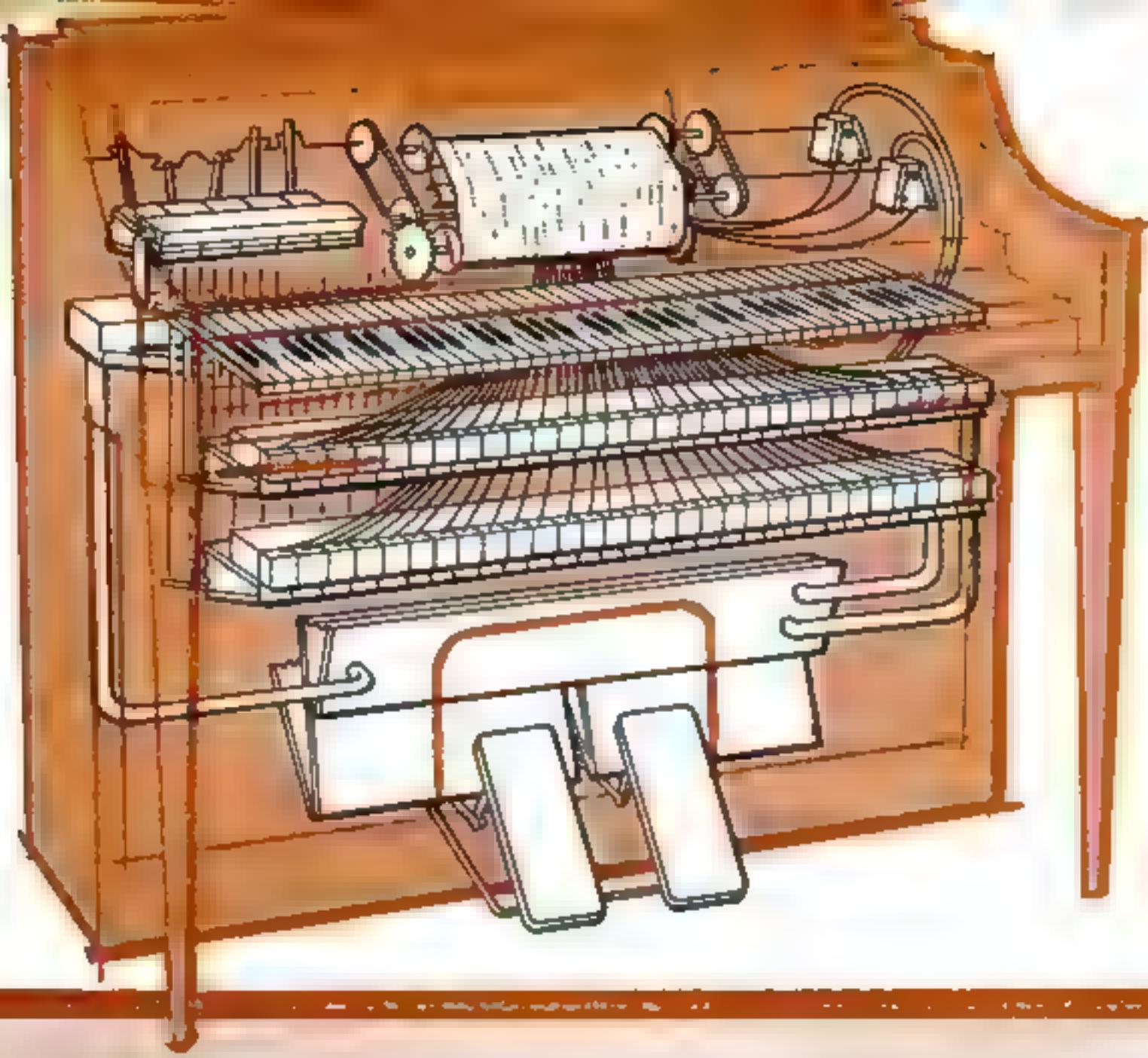
MOVIE FLOOD with a sealed beam is rated at 650 watts, but it gives as much light as four 300-watt R30 lamps and lasts twice as long: eight hours instead of four. It contains its own reflective coating, needs no separate reflector. With holder and cord, it sells for \$19.95; lamp replacements, \$5.45 each. Westinghouse, Bloomfield, N. J.



LIGHT FILTER in a pocket holder lets you view light-and-shadow contrast as they will actually appear in the finished photo. You can then shift indoor lighting or wait for better outdoor conditions. Contrast Viewer costs \$2.95. Bausch & Lomb, Rochester, N. Y.

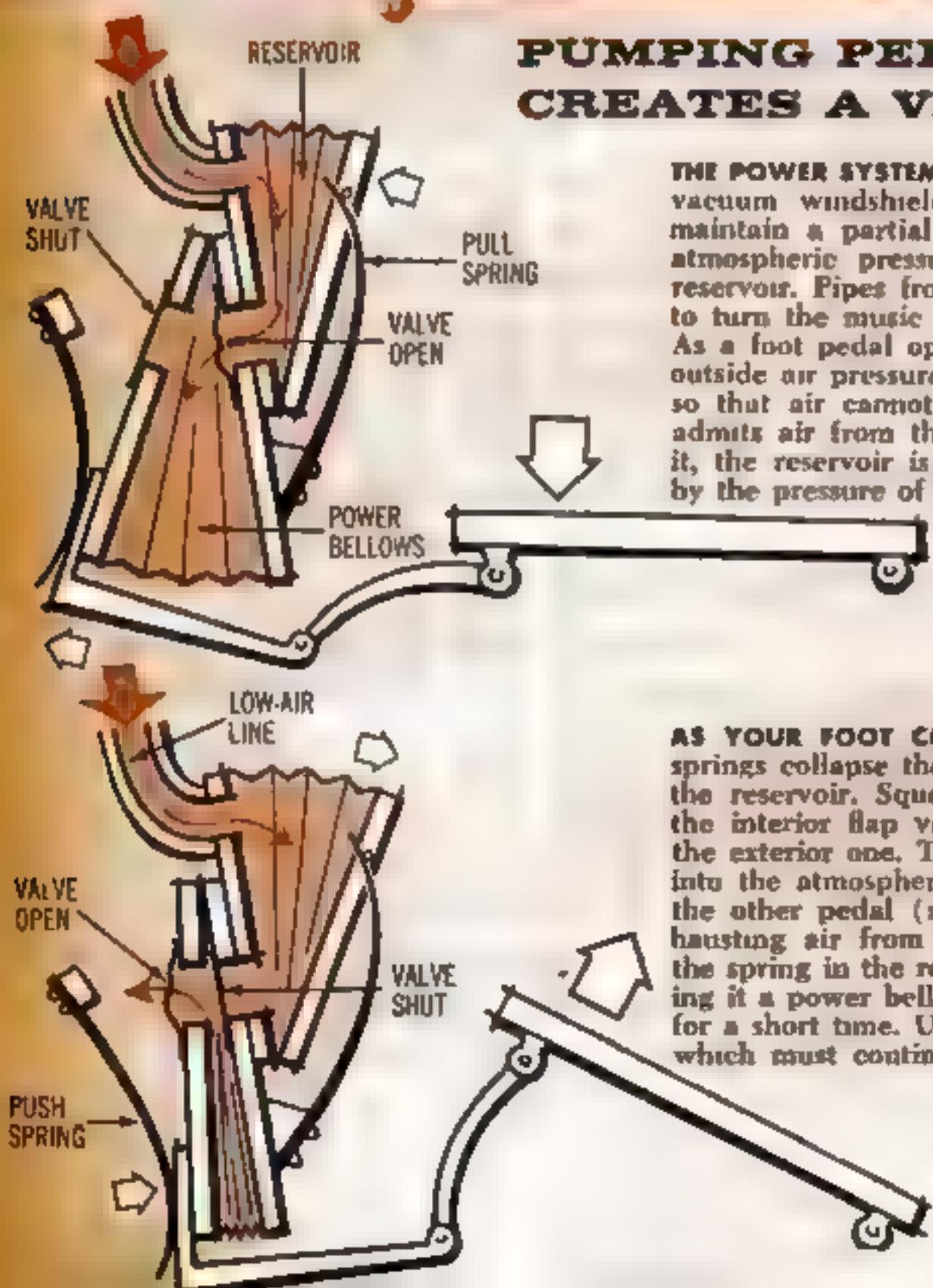


CAMERA ADAPTOR enables you to project slides through the lens of a Rollei having a detachable hood. You simply remove the focusing hood, invert the camera, and insert it in a frame on top of the projector. The adaptor with a double 2 1/4-by-2 1/4-inch carrier is \$49.50; 2-by-2 carriers, \$2.50 each. Burleigh Brooks, Inc., 420 Grand Ave., Englewood, N. J.



PUMPING PEDALS CREATES A VACUUM

THE POWER SYSTEM of a player piano resembles that of a vacuum windshield wiper. Two foot-powered bellows maintain a partial vacuum (about $1\frac{1}{4}$ p.s.i. less than atmospheric pressure) in a spring-loaded, bellowslike reservoir. Pipes from this run where power is needed—to turn the music roll and hit the strings, for example. As a foot pedal opens one of the power bellows (left), outside air pressure shuts an outward-opening flap valve so that air cannot enter. But an inward-opening valve admits air from the reservoir. As air is exhausted from it, the reservoir is partially collapsed against its spring by the pressure of the outside air.



AS YOUR FOOT COMES UP, pedal linkage lets exterior springs collapse the power bellows, now full of air from the reservoir. Squeezed by the bellows, this air closes the interior flap valve to the reservoir but blows open the exterior one. The closing bellows thus forces air out into the atmosphere. Meanwhile the bellows worked by the other pedal (not shown) takes over the job of exhausting air from the reservoir. Should pumping stop, the spring in the reservoir bellows tends to open it, making it a power bellows temporarily to maintain "low air" for a short time. Units that use power admit outside air, which must continuously be pumped out.

How a Player Piano Works

After years of obsolescence, the player piano is making a comeback camouflaged as a spinet. Music rolls of both new and old favorites are pouring from revived factories. Fans find treadling such fun (you can express yourself in the music by rhythmic pumping, varying foot pressure while working the controls) that the makers aren't electrifying it. And, in this era of runaway prices, the player piano seems an astonishing holdout. In its heyday a good one cost over \$1,000. Though still largely hand-

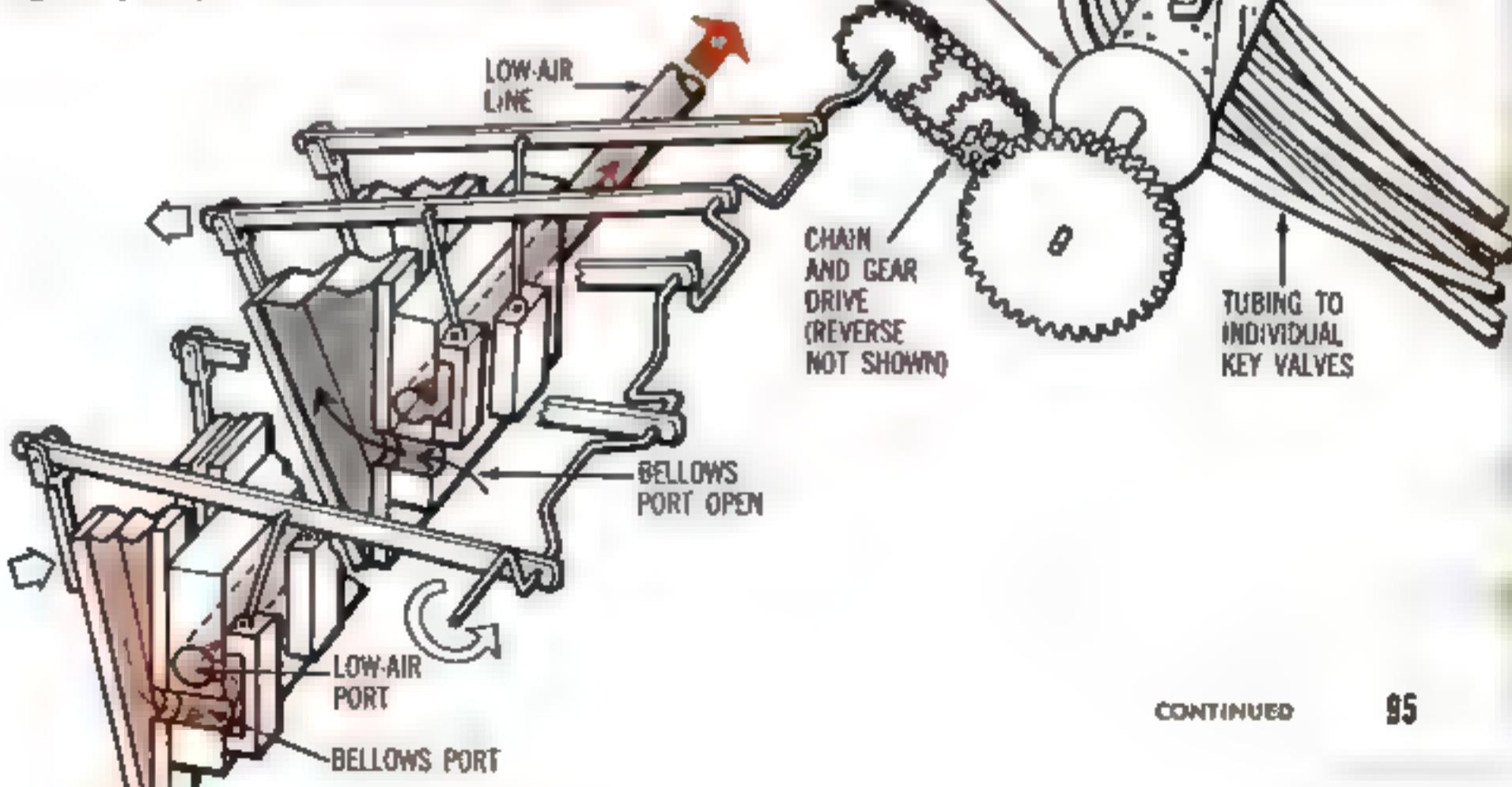
made, the new spinet player above costs slightly less

Early mechanical players were set in front of a piano and pressed the keys with mechanical fingers. One of this kind hit the American market about 1896. But buyers preferred to have the works inside, and that became universal.

The paper rolls were produced mechanically until a German manufacturer named Edwin Welte designed a piano with electric key contacts. On this, the pianist himself created the master roll,

A FIVE-BELLOWS MOTOR DRIVES THE MUSIC ROLL

ROTARY POWER IS GENERATED by five smaller bellows connected to a crankshaft. Linked to each connecting rod is a hollow-faced slide valve. The low-air line runs to a port under each valve. Another port to bellows is nearby. As a valve cavity bridges both ports (at bottom below), low-air suction draws air from bellows, making atmospheric pressure collapse it. This turns the crankshaft, moving the slide valve. When it uncovers the bellows port (see middle one below) air enters, and bellows open again. Overlapping impulses give smooth action which, through chains and gears, turns the takeup spool for playing the piano, or the music roll for rewind.



CONTINUED

recording not only every note and its precise length, but even his tempo, phrasing, and dynamics—the key-striking force.

The player piano is an air-powered instrument, in which pumping the foot bellows creates a partial vacuum. Other bellows are connected by piping. Higher outside air pressure putting the squeeze

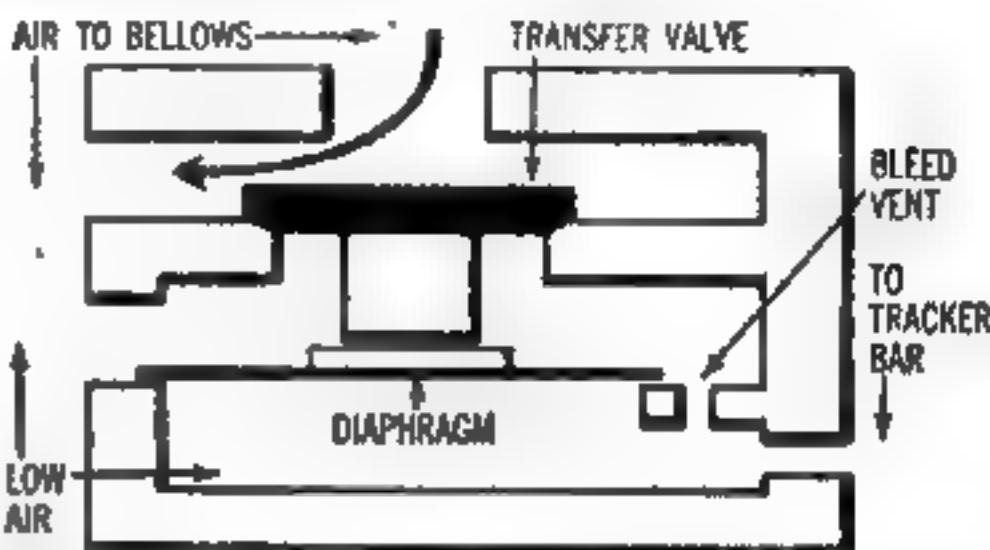
on them provides the mechanical power.

Today's player piano has a governor to maintain set tempo no matter how furiously you pump, and a device that centers the paper roll pneumatically on the perforated tracker bar. Once again called the Pianola, the spinet player is the product of Pianola, Inc., NYC. ■ ■

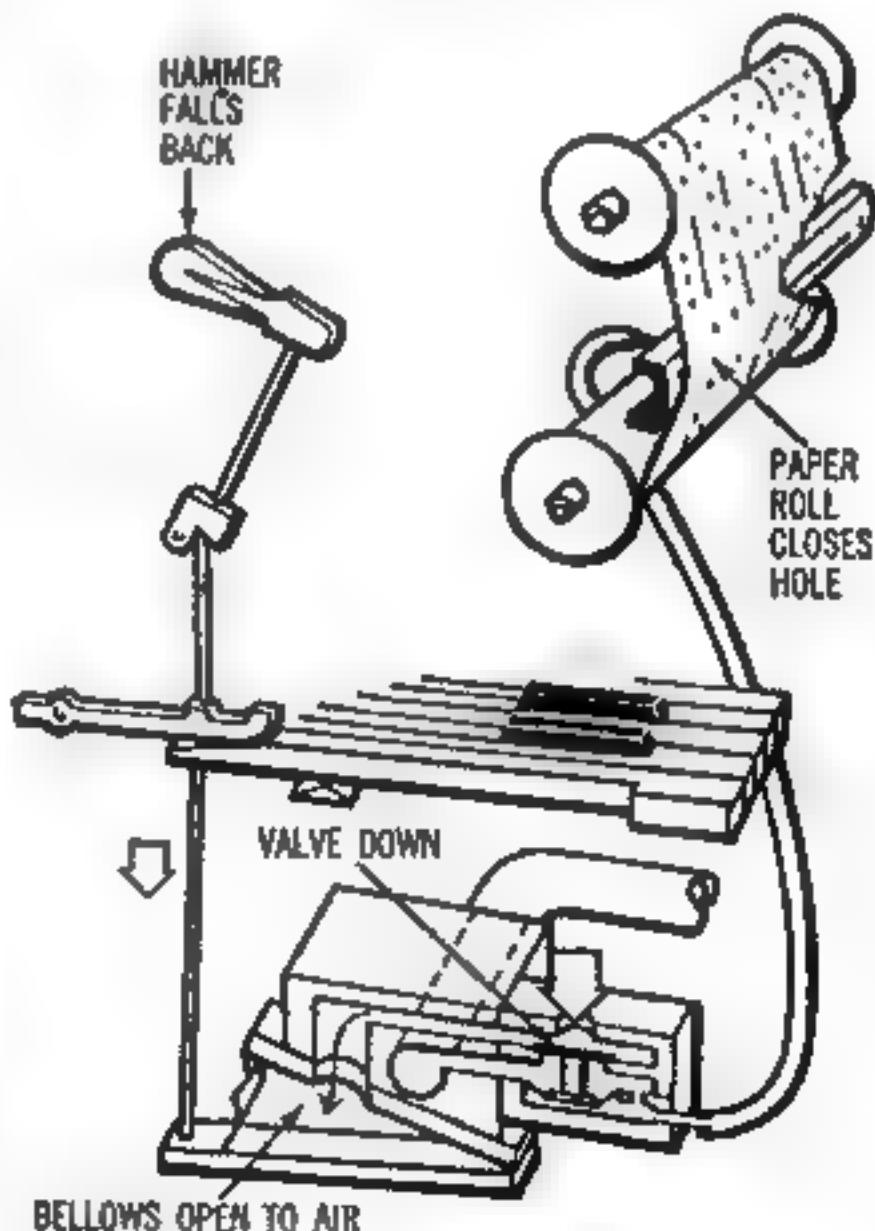
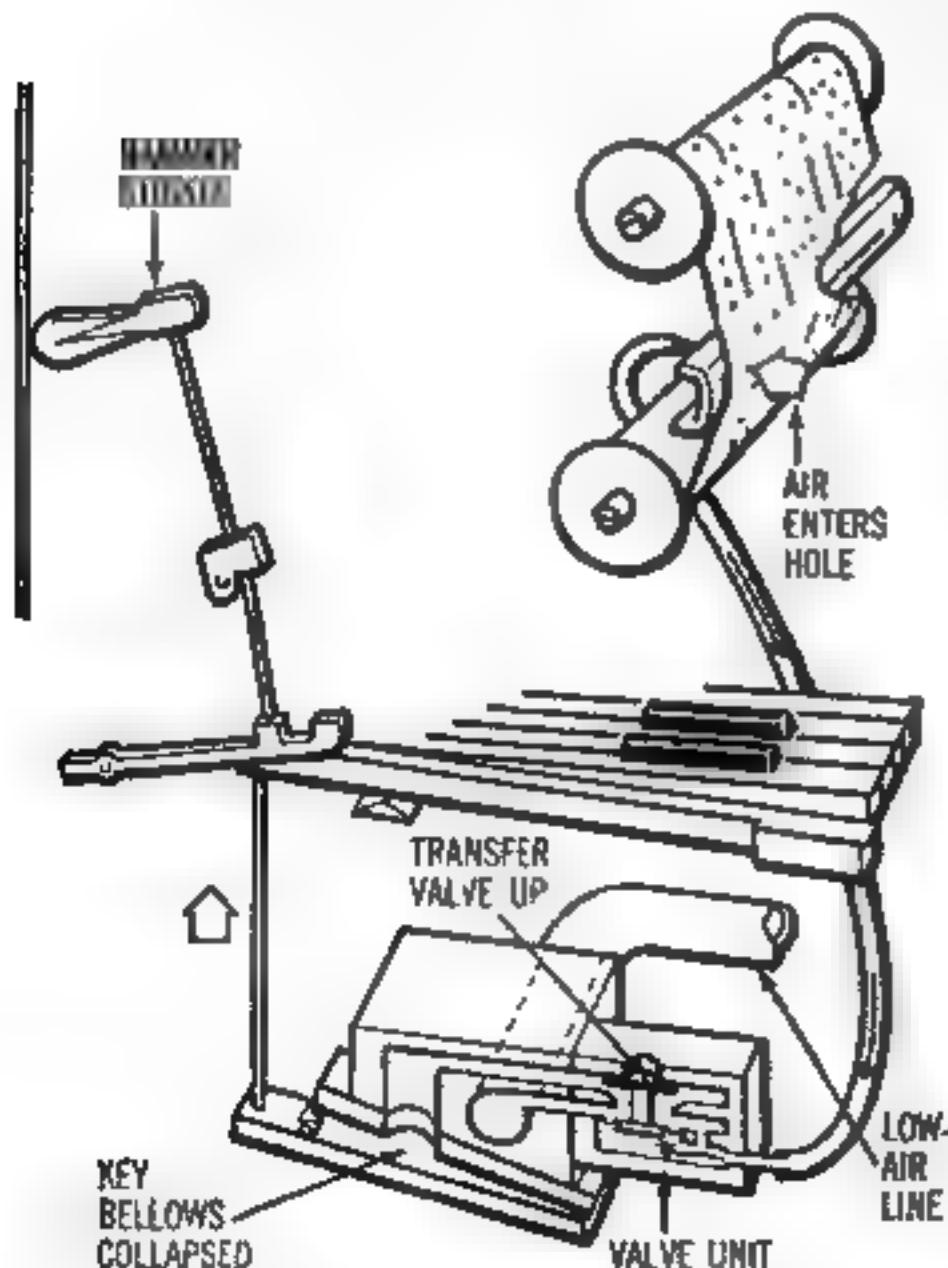
HOW AIR PRESSES THE KEYS

EACH KEY IS LINKED to its own tiny bellows channeled to upper chamber of a valve unit (shown at right). Low-air line exhausts lower chamber above a diaphragm and, through a bleed vent, the space below it, which is connected to a hole in the tracker bar over which the roll runs. With low air on both sides, diaphragm lies flat. Atmospheric pressure holds down a two-faced transfer valve, sealing lower chamber but opening bellows to atmosphere (below, right). As a hole in a music roll uncovers one in the tracker

bar, air in tubing and under diaphragm is exhausted through the vent. The diaphragm flattens and lets the valve drop. This opens the bellows to atmosphere again and draws the hammer back to its previous position.



bar, air in tubing and under diaphragm is exhausted through the vent. The diaphragm flattens and lets the valve drop. This opens the bellows to atmosphere again and draws the hammer back to its previous position.





Dockside telephone

Some cities have curb-side pay phones you can use from your car. The Eisenhower State Park Marina on Lake Texoma, near Denison, Tex., went them one better. It had one installed on a dock for float-in phoning.



FAIRED-IN HEADLIGHTS and rectangular grille are new. The 136-inch-long roadster has an 80-inch wheelbase.

LOCKING TRUNK LID is offered on Sprite for first time. Tail lights are also restyled.



More bite for the Sprite

The diminutive Austin Healey Sprite, one of the lowest-priced sports cars, has grown slicker.

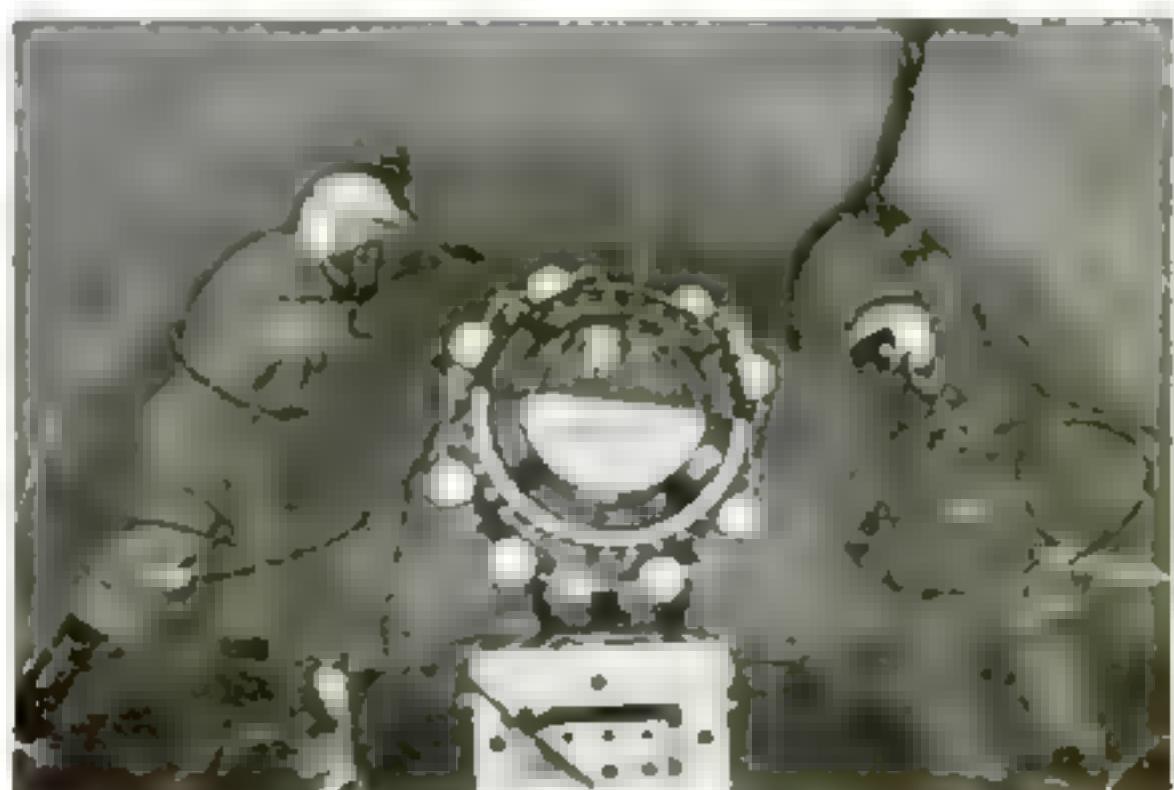
Gone are its familiar bug-eyed headlights and grinning grille. Changes under the hood include a higher compression ratio (now 9:1), larger valves, and improved carburetion. Result is a 25-percent power increase; the 57.9 cu.-in. four now generates 50 hp. Top speed is over 85 m.p.h. Price, still around \$2,000.



Solar golf cart

Energy from the sun drives this car around the golf course. It is powered by batteries, shown here drawing a new charge from a panel of solar cells.

The demonstration was put on by Hoffman Electronics Corp. of Los Angeles, makers of solar cells.



Space test for liquid hydrogen

A flying laboratory enables Convair engineers to find out how liquid hydrogen reacts to weightlessness. A container of hydrogen (center) is put in a balloon which is inflated inside the fuselage of an Air Force KC-135 tanker. At 35,000 feet, the plane is put into a shallow dive and maneuvered to achieve zero gravity. Since leaking hydrogen could explode in air, the nylon bag is filled with nitrogen, making it necessary for the "floating" engineers to wear oxygen masks. Liquid hydrogen will propel the Centaur space booster.

Remember the B-36?

A dozen years ago, this incredible "flying apartment house" was our first line of defense. Now it's an epic museum piece

By Wesley S. Griswold



First B-36 dwarfs a B-29. Mark I's two huge landing wheels gave way to a more balanced set.

THE B-36 was the biggest bomber the world ever knew, and it lived and died without having to fly through anything worse than a war of words.

That was darn lucky for the United States, said many top Navy officers, who could never speak of the huge plane without getting mad.

Leading British aeronautical engineers, and even some prominent American ones, openly snickered at the B-36. Yet the U. S. Air Force claimed, in the late 1940s, that it was invincible. Maybe it was. At least, there was never anything else like it.

People with a fondness for splicing statistics found a mouthful here. The B-36 could tote a 10,000-pound bomb load 5,000 miles, drop it, and fly home again without refueling. On shorter hops it could lug along as much as 84,000 pounds of high explosives. Its bomb bay had the capacity of three railroad boxcars.

The giant craft could climb until it

could no longer be seen or heard. Its 230-foot wingspan was considerably greater than the length of the Wright Brothers' first flight. Its wing was $7\frac{1}{2}$ feet thick at its fattest part, and contained a crawlway, providing access to the engines.

The 163-foot-long plane had 10 engines, developing a total of 44,000 hp., as much as nine locomotives or 400 automobiles. It could generate 160,000 watts of electricity, and contained 30 miles of wiring. Its de-icing system could have heated a 600-room hotel. The 30,000-plus gallons of fuel it took off with would have sent a car around the world 18 times.

The big bomber's crew of 16 could take turns napping in eight bunks on long flights. Out in the tail, there were an electric stove and refrigerator, folding chairs and retractable tables.

What did all these men do? Well, in a sample B-36 lineup toward the end of the bomber's career in the Strategic Air Command, there were a plane commander, a pilot, two flight engineers, a radar-bombardier, a navigator, a nose



In March '49, four jets were



added to the B-36's power plant, a pair under each wingtip. Final horsepower: 44,000.

gunner, two radio operators, a forward gunner (who was also a copilot), a forward gunner-observer, two lower-aft gunners, a tail gunner, and two upper-aft gunners.

Connecting the pressurized cabin and tail was a tunnel that ran through the unpressurized middle. To go from one end of the plane to the other, the traveler rode through the tunnel on a flatcar, pulling himself along by an overhead cable.

The B-36 mounted 16 guns, which was why it was often called the Flying Battleship. It was also given less flattering nicknames: Magnesium Monster, Flying Apartment House, Sitting Duck, and, most distasteful of all, Billion-Dollar Blunder.

The controversy. It was Admiral Arthur W. Radford who gave the B-36 this last, surly label. Radford earnestly believed that super aircraft carriers were a much better investment for the taxpayer. He was blunt in asking if the B-36 was really as good as it was cracked up to be. Could it fly fast and high enough to do its job?

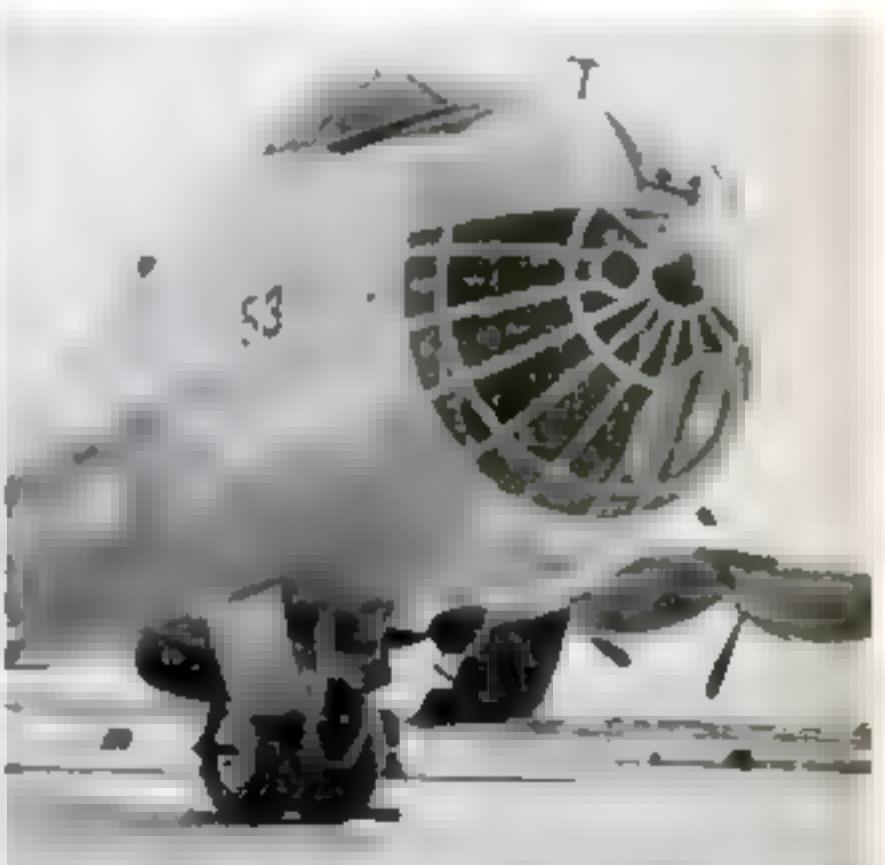
The Navy said no. The British said no. The U. S. Air Force said yes.

This elephantine bomber was conceived in mid-1941. Western Europe then was largely in Nazi hands. England was enduring the worst of its blitz. The outlook in the Pacific was bleak. Air Force planners realized they might have to deal

with Germany and Japan from home bases entirely.

There were no jet interceptors or guided missiles to worry about. Anti-aircraft fire was still fairly low and inaccurate. Fighter planes were all propeller-driven and not very fast.

The Air Force asked for a bomber with a 10,000-mile range, 10,000-pound payload, 35,000-foot ceiling, and a cruising speed of 240-300 m.p.h. Moreover, it would have to be able to use 5,000-foot



"GREENHOUSE" was the crew's name for the front. Besides the pilot's plastic bubble, the navigator and bombardier had wide glass areas below. Guns stuck out from under canopy.

Faster planes and new tactics made the big B-36 obsolete



BOX FORMATION was standard for B-36s in group flight. With sixteen 20-mm. cannon on

each plane, they could cover every quadrant of the sky with heavy fire in case of attack.

runways—quite a feat for a monster of that size.

All these requirements were considered fantastic. But Consolidated Aircraft came up with a design, to be powered by six 3,000-hp., pusher-type, propellered engines. Development dawdled, however, as the favorable progress of World War II made it seem less essential.

Then came the atomic bomb and, with the end of the war, the almost immediate evidence that Russia was going to become the new world threat. The U. S. was the only nation with the A-bomb. It had to have a means of delivering it to any target in Russia, if necessary. The B-36 seemed the obvious bird to bank on.

The improvements. Consolidated had meanwhile merged with Vultee and become Convair; and on Aug. 8, 1946, it launched its first B-36. That experimental model had two enormous main landing wheels, more than nine feet in diameter. But these concentrated too much weight on too small an area of runway. So, when the first production model of the B-36 rolled out, a year later, it had

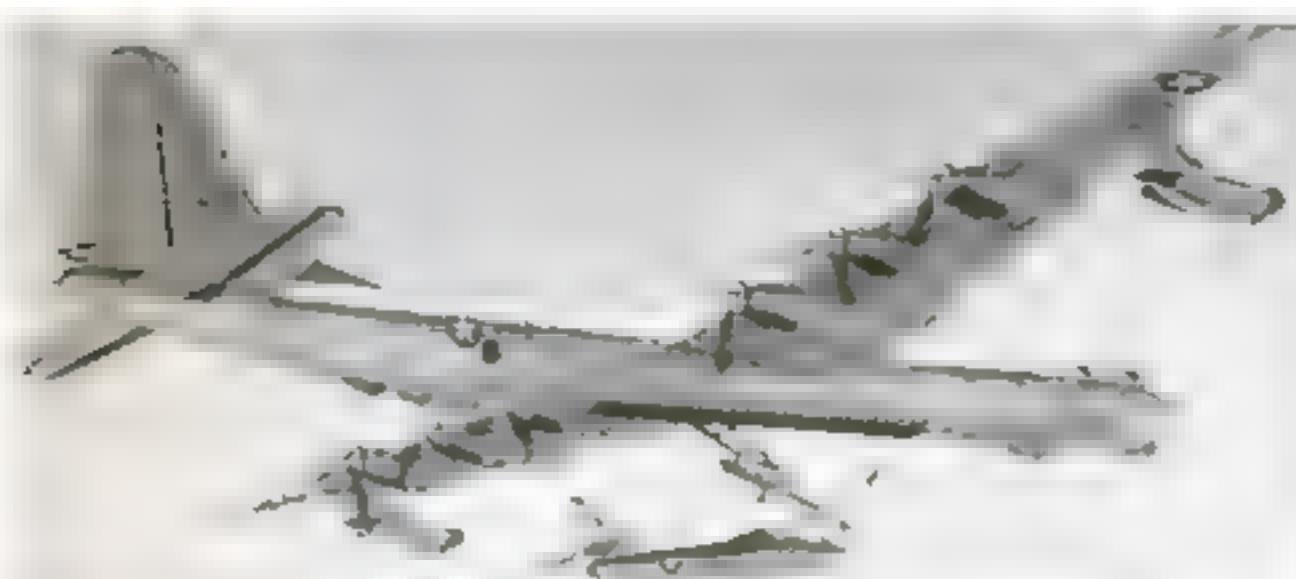
eight landing wheels, about half the size of the originals. It also had a bubble on its nose, so the pilot could get a better view.

These changes were the first of many. Between August, 1947, and August, 1954, it ran through 10 model changes. The horsepower of its propeller engines rose from 3,000 to 3,800 apiece. Beginning with the D model, which first flew in late March, 1949, four jet engines were added, a pair under each wingtip.

Meanwhile, the world's biggest bomber strained toward greater heights and higher speeds, until in midsummer, 1949, the Air Force revealed that a B-36D had topped 435 m.p.h. and climbed above 50,000 feet.

The Air Force had no sooner released these performance figures than the Navy shouted that they weren't good enough. Their own Cutlass, Banshee, and Panther jet fighters could all climb to the B-36's ceiling in a few minutes and knock it out of the sky.

A few Congressmen were all for giving the Navy a chance to put up or shut up.



A BODYGUARD for B-36 was needed, it was thought, as fast jets developed. So this modified RB-36 was fitted out to take aboard or launch a light fighter plane. But the experiment got nowhere. One trouble: The little plane, even in retracted position, slowed momma down too much.

and it landed on the scrap heap

But that wasn't in the interest of national security, rumbled the Defense Dept.

Even U. S. airmen themselves disagreed about the B-36. Gen. George Kenney, first commander of SAC, said it would be dandy for night bombing, but he wouldn't use it in the daytime. Gen. Curtis LeMay, who succeeded him, said the plane was great day or night. Gen. Hoyt Vandenberg said B-36s could fly far enough, fast enough, and high enough to drop A-bombs on any target in Russia. That fact, he said, was the best insurance against war.

Question from Britain. While the fight raged on in Washington, some British aeronautical engineers couldn't help raising their voices, too. Britain's Vampire jet interceptors, one expert declared, could climb to the B-36's best level in eight minutes, and fight right on up to 56,000 feet. And, he added, the Russians probably had something just as good.

"We fancy that our American friends are prone to underestimate the height of the Iron Curtain," wrote the editor of Britain's *Flight and Aircraft Engineer*.

But the B-36 calmly rode out the controversy and remained, for a time, the mainstay of SAC. The Navy got its super-carriers anyway, and the storm blew out to sea.

The B-36 finally retired to make way for waves of much faster B-47s and B-52s.

Altogether, there were 385 B-36s built, at a cost of around \$3,000,000 each. Most of them have now been cut up for scrap. The last to come off the production line, in mid-August, 1954, is now a public monument at Amon Carter Field, Fort Worth.

Like almost all super-big objects, the B-36 was often a figure of fun. For one thing, despite all the brave words about its mounting speed, the B-36 sounded slow. The acoustical mix of its piston and jet engines resembled nothing so much as the noise of a distant race among sedate motorboats.

Before each landing, some rear-crew member had to come forward through the tunnel, crawl out into the wing, and gaze through the wheel wells to make sure the main gear was down and locked. Another peered out through a hatch in the floor of the forward radio compart-



PILOT PERCHED in a position 30 feet above and 80 feet ahead of his landing wheels. Here he indicates the jet controls—usually handled by the copilot, whose seat is at right.

ment to be certain the nosewheel was ready for touchdown.

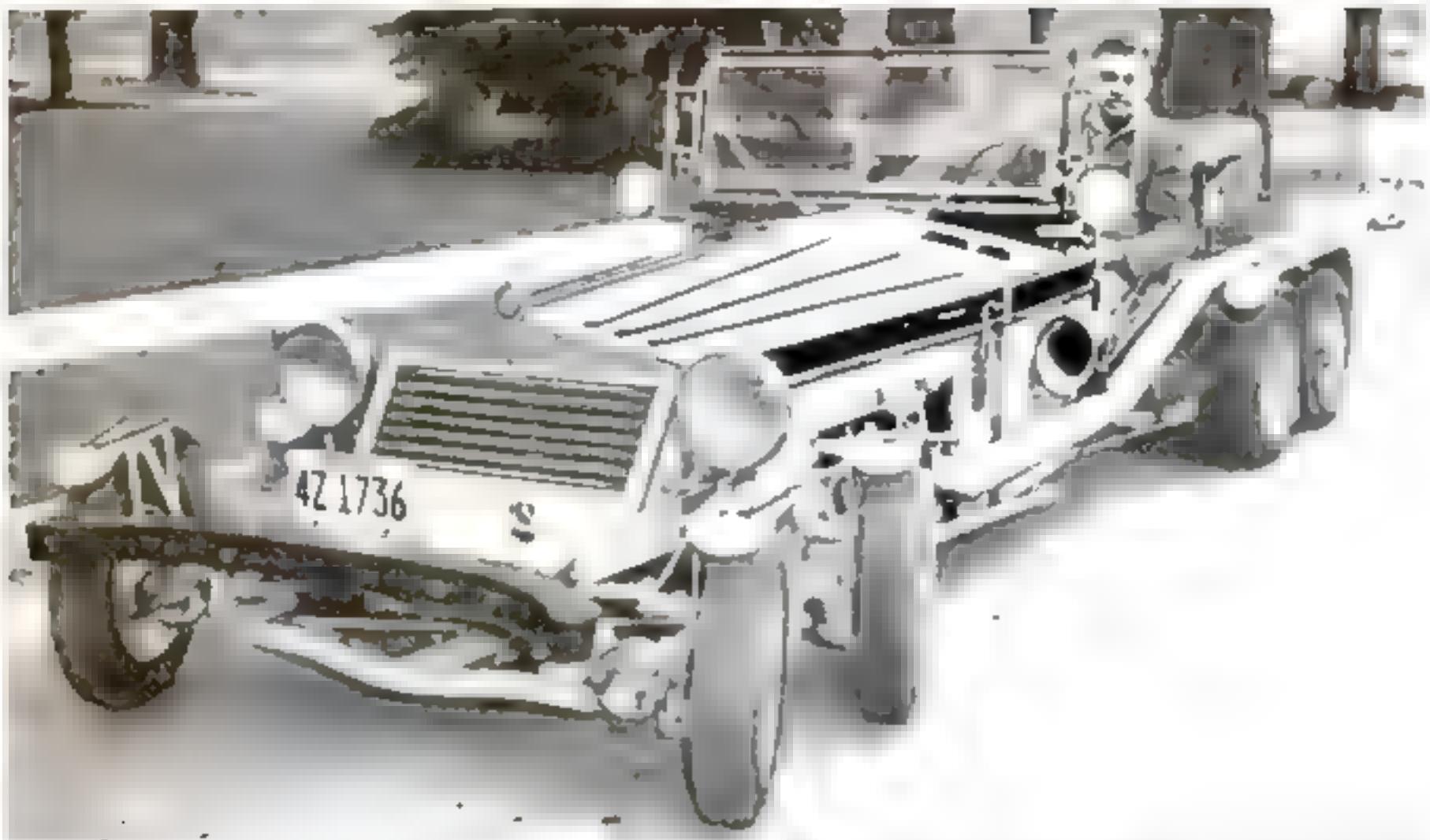
There was something ludicrous, too, about the fact that the pilot sat 30 feet higher than the landing wheels and about 80 feet ahead of them. And he never moved the bomber's controls directly: All he did was manipulate spring-loaded tabs, which caught in the slipstream and tugged the huge control surfaces in the direction the pilot wanted them to go.

B-36 pilots had to take lightplanes aloft between missions in order to keep fresh the vital "dimension awareness" of flying. For, as one of them said, piloting a B-36 was "like sitting in a bay window and flying an apartment house."

Still, no matter how much one joked about the B-36, it had two qualities every crewman was grateful for. It was immensely stable and rugged.

A B-36 once lost three engines on the same side and still made a perfect landing. Another dropped its rudder on a low-level flight, but kept right on going for 250 miles before it set down—safely.

Because the B-36 carried the A-bomb, it was called the Big Stick. But because it merely held the Bomb and didn't drop it, the mammoth ended its career with the proud name—Peacemaker.



ALL FOUR FRONT WHEELS turn at once. Tiny 4.50-by-12 tires cost less than half as much as

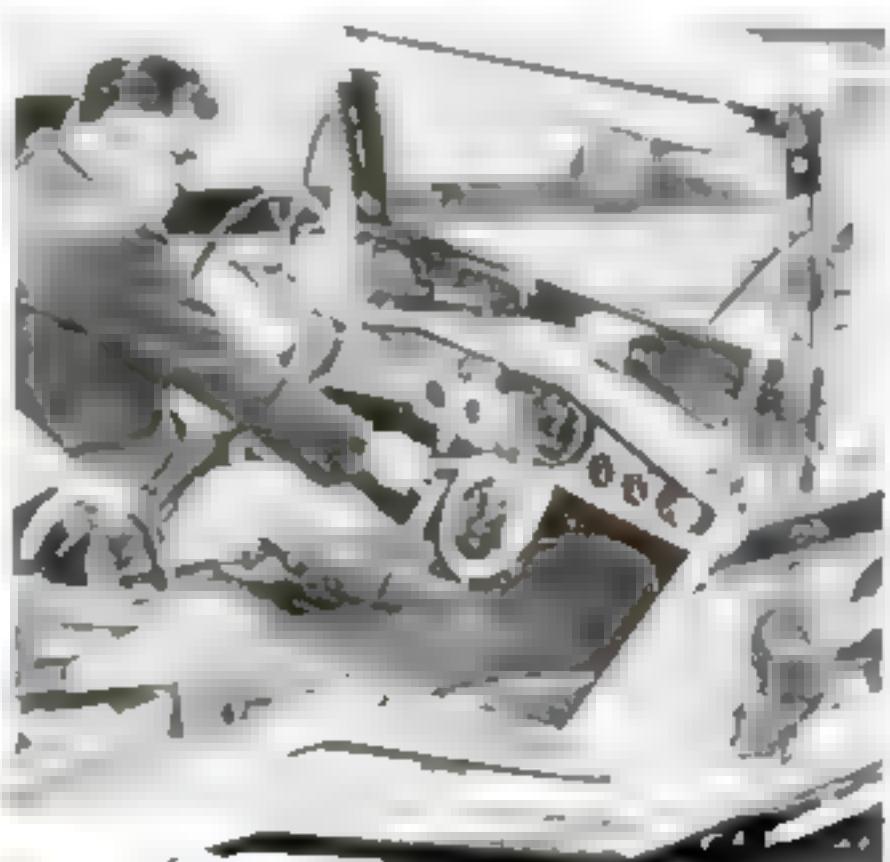
standard tires. Large lights, Klaxon horns, straight windshield pack plenty of nostalgia.

Eight-wheeled car

If railroad coaches have eight wheels, thought Enoch Johnson, Red Wing, Minn., machinist, why shouldn't automobiles? So he built this one.

Every component, except for a few he made himself, stems from Dodges up to 46 years old. Trimmed with mahogany and painted a dazzling yellow, the 2,200-pound machine makes an arresting sight. "It rides great," says Johnson. "The eight wheels glide over bumps and dips like a snake crawling over the ground."

PROPANE-GAS TANK by Johnson's side is used in place of choke when starting the car. Huge exhaust collectors (over running boards) lead from a 250-hp. Dodge V-8. Rear-mounted radiator has two electric fans; water circulates through the car's frame, made of 2½-inch pipe.



Respiration dummy

A new manikin teaches British first-aid students the art of mouth-to-mouth artificial respiration. It consists of a head, windpipe, and transparent lungs so a learner sees the effect of his breathing.

The head must be held back at the correct angle to keep from blocking the air passage, and the nose pinched and released rhythmically like a valve. A plastic face mask may be sterilized. The model folds up compactly to carry or store.





Royal southpaw: Queen Mother Elizabeth. Charlemagne, da Vinci were lefties, too.

It's a Clumsy World for Lefty

... But getting better. Now he can get left-handed rifles, saxophones, penknives—even checkbooks

ABOUT 10 percent of all newspaper readers who saw a recent photo of Britain's Queen Mother Elizabeth shooting pool got a special kick out of it.

Why? Because, with the confident stance of an old pro, the royal lady was wielding the cue with her *left* hand. She has the same problem they have.

She and 300,000,000 other people live a more or less frustrated existence in a right-handed world. They deal as best they can with doorknobs, zippers, buttons, gearshifts, tools, scissors, musical instruments, telephone dials, corkscrews, can openers, and a whole catalogue of other objects not designed for their convenience.

But Lefty leads a far happier life than he used to. There was a time when parents shouted: "You'll learn to use your right hand or else!" As a result, a few high-strung kids were left stuttering in protest, and clumsy with both hands.

Today, warned by psychologists, par-

ents are inclined to let a left-handed youngster be himself. The theory now is: If you're a lefty, be a good one.

Nobody cared. There was only a feeble effort to take pity on the left-hander a century ago. It produced a spate of left-handed shaving mugs with a side mirror to the right of the handle. There was a somewhat larger production of left-handed mustache cups.

Nowadays, manufacturers cater to the 18,000,000 left-handed Americans by making scissors, shears, baseball gloves, sickles, refrigerators, pocketknives, golf clubs, dental equipment, fishing reels, bowling balls, one-armed writing chairs, rifles, and saxophones for them alone.

As long ago as 1945, the Trade Bank & Trust Co., New York City, started providing left-handed checkbooks—stubs printed at the right of the check. Since any well-trained checkbook user files out the stub first, a left handed client thus will avoid the risk of smudging the ink



WITHOUT STOPPING, a lefty can rapid-fire the new Savage, working bolt with his best hand.

with his knuckles when he starts writing the check.

Taking pen in hand. The big trouble with writing left-handed is that the penman drags his hand over what he has just written. It's also harder work, for he pushes the pen, whereas the right-hander pulls his along. Furthermore, the lefty can't see what he has written last, for his scribbling hand is in the way—unless he has been taught to grasp the pen higher up than the right-hander does.

An important aid to the left-hander is to arrange the paper with the top left corner uppermost—just the opposite of what suits right-handers. This gives relief from the cramped writing position so often the mark of the lefty.

One way to lead the lefty's customarily cramped writing hand to greater legibility is to guide it in scribbling from left to right (which doesn't come naturally to it), and in making big, flowing, clockwise loops across the page.

It's possible to turn the ostensible handicap of left-handedness into a very tidy asset. Edward R. Murrow, for instance, has been called "the best left-handed putter in Christendom." And no baseball fan is likely to forget the shining

Now the Bolt's on the Left—Where Southpaws Want It

DESPITE the fact that millions of hunters are left-handed, not until two years ago was there a rifle or shotgun designed especially for them.

Early gunsmiths coped half-heartedly with the problem by providing duplicate cheek pieces on both sides of their stocks—the rest was up to the user. Since then, lefties have put up with rifles they had to turn upside down to load, shotguns with precisely built-in castoff slant precisely on the wrong side, and ejection mechanisms designed to spew a stream of used shells right across their startled eyeballs.

When World War I introduced the bolt-action rifle on a really big scale, southpaw shooters had had it. Slide- and lever-action guns were barely manageable; bolts were impossible. The Army had one answer: force all recruits to shoot right-handed—usually with less than spectacular success. Sportsmen either paid for expensive alterations on their shooting pieces or simply didn't buy bolt actions at all.

But recently, one noted firearm maker—Savage Arms—took pity on the suffering southpaws. First came a left-handed version of its famous Model 110 bolt-action rifle.

examples of Babe Ruth, Lefty Grove, Stan Musial, Johnny Podres, and Warren Spahn.

And while we're still on the diamond, consider the pitcher-spooking versatility of Mickey Mantle. In a game against the Detroit Tigers last May, he hit a left-handed homer in the eighth inning and a right-handed homer in the tenth.

Is it inherited? Scientists haven't yet decided whether left-handedness is the result of heredity or environment. Most think it comes from a blend of the two.

There is evidence that when both parents are left-handed, half their children will be. If only one parent is a lefty, one child in six is likely to be in the same boat. If neither parent is left-handed, there is still a one out of 16 chance of it showing up in a child.

However, a baffling fact weakens the heredity theory: 20 percent of all identical twins are opposite-handed, one preferring the right, the other the left. Since identical twins result from the split of a single embryo, they have identical genes. Therefore, a difference in handedness between them cannot be hereditary.

Another mystery is why twice as many boys as girls are left-handed.



SHELLS EJECT TO THE LEFT of this special 12-gauge Savage shotgun, out of shooter's line of vision. On standard models, shells fit uncomfortably across a southpaw's eyes.

made in several calibers for about \$125. For the first time now a lefty could rapid fire a bolt action without stopping after each shot to switch hands and throw the bolt with his right. Sales zoomed.

Savage soon added a 12-gauge shotgun in which the shells were ejected to the left instead of to the right across the user's line of vision. Known as the Model 30L and ACL.



ONLY HOPE FOR SOUTHPAWS before new left-handed guns was custom conversion. Here you see a left-bolted .30-40-cal. Steyr. Such alterations often cost \$200 for machining alone.

it sells in standard and deluxe versions for about \$85 to \$90. Except for their left-handed orientation, shotgun and rifle have the same working parts as their right-handed cousins.

While telephones and doorknobs are still for righties, southpaws are at last getting a break where accuracy and safety are an absolute must —Ken Warner.

Doctors have long known that people often prefer the use of one eye, or foot, or even one side of the jaw to the other. The command comes from the side of the brain opposite to that of the body member. For instance, the right side of the brain controls the left hand. Also, the center of speech and expression is on the same side of the brain as the center of motion, and close to it. This has led to the theory that when a child is forced to change handedness, the resulting confusion spreads to his speech center and garbles his tongue.

There is no proof, however, that forcing a nervous youngster to change hands is more likely to make him stutter than obliging him to give up teasing the cat. The point, say psychologists, is that no emotionally unstable individual should be forced to do anything. Encouraged, yes, but not shamed or whipped into it.

Can you prevent it? One confusing fact is that young babies use either hand equally well. They simply reach with the hand that's closest. The best way to encourage them in the direction of a more agreeable later life is to put everything they're expected to touch within easier reach of the right hand.

Between the ages of six months and a year, a child's natural preference begins to assert itself. Most children decide the matter once and for all between the ages of three and seven.

If someone's kid is sprouting fast and still hasn't made up his mind which hand he prefers, it's advisable to take him to a clinical psychologist. Tests will help determine the degree of left-handedness.

If the youngster's preference is simply not very strong, it should be easy to encourage him to switch hands. If nature really intended him to be a lefty—well, let him learn to be a ballplayer.

There are shreds of comfort. Researchers at the University of Wisconsin have found that left-handed students are notably quicker with the left than right-handers with the right. Other researchers report that the majority of cats are left-pawed, and that parrots are predominantly left-clawed. In between are rats, rhesus monkeys, and chimpanzees, which seem to be able to do equally well with either front foot or paw.

The sinister left. There's no telling when things to the left first got a bad name, but it was in the dim reaches of

[Continued on page 223]



RADIO RECEIVER in can (circle) mounted near top of pole picks up signal and starts timing

device that controls system. Warning light and bell are between the traffic light and pole.



Double-decked fishing boats

Most of them loaded in tiers above deck, 99 fishing boats were put aboard the freighter *Talkeetna* at Seattle bound for Alaska. The 32-foot gill-netters are valued at \$10,000 each and can hold 4,000 fish. The largest fleet sent to the 50th state at one time, the boats were part of a shipment of 223 by the Alaska Steamship Co.



\$10,000 horse blanket

Some lucky horse will soon be wearing the pure-vicuna blanket shown on display above. H. Kauffman & Sons, New York City saddlery firm, made the eight-by-eight-foot covering for presentation to "the horse of the year," to be selected by leading horse-breeding and riding groups in November. Its value: \$10,000.



TOUCHING BUTTON on transmitter turns traffic light red four ways, lights warning signal, and rings bell at intersection for 30 seconds.

INSIDE CONTROL CAN: Chrysler adjusts receiver, which gets signal through antenna at bottom and triggers pneumatic timing relay at top.



Fire trucks control traffic lights

Fire trucks, police cars, and other emergency vehicles can turn traffic lights red in all directions as they approach dangerous intersections in Lorain, Ohio. The driver simply presses a button on a radio transmitter mounted on the windshield. Its signal, with a range of 100 feet, is picked up by a receiver mounted on a power-line pole at the nearest intersection. This triggers a timing device that turns the traffic light red in four di-

rections for 30 seconds, puts on a warning light, and rings a bell. The driver of a following emergency car can gain 30 seconds more to pass by pressing his transmitter button.

The system was designed by Lorain Fire Chief Alfred G. Nickley and Thomas Chrysler, superintendent of police- and fire-alarm telegraph. Chrysler built it mostly from parts of confiscated pinball machines, illegal in Lorain.

Aircraft flies on flexible wings

The kitelike machine at right may look like something out of a museum, but it's no antique. Ryan Aeronautical Co. built it for testing in flight for the National Aeronautics and Space Administration and the Army.

Its V-shaped wing of flexible nylon is attached to poles at center and edges. Slung under it is a platform with pilot in front, pusher-prop engine at rear, cargo space between. Tilting the 555-square-foot wing steers the plane. The wing folds compactly for storage. The Army is interested in the plane,



both as a glider and with engine, for cargo and troop carrying; NASA sees it as a parachute to recover for re-use the costly Saturn-rocket first-stage engine.

The Mystery of the Forgotten Briefcase



By Walter S. Bowen and Harry Edward Neal

IN 1914 a war flared in Europe, a struggle that was to embroil many nations in what history now calls the First World War. The United States, not yet involved, sought to mind its own business, and President Woodrow Wilson issued a proclamation of neutrality.

As a neutral, America had every right to sell goods—including munitions and other war materiel—to any and all purchasers on a cash-and-carry basis.

Since Great Britain and France controlled the seas, and Germany herself could not obtain war goods in the United States and get them past the fleets of her enemies, the Germans sought desperately to prevent her opponents from replenishing their stockpiles from America. There were two ways—sabotage and propaganda in the United States.

Both methods were being used soon after President Wilson's proclamation was made. Stories in certain magazines and newspapers sought to gain American sympathy for the German cause. Strikes were called in factories producing the goods of war.

Wilson ordered Secretary of the Treasury William Gibbs McAdoo to send Secret Service agents into action against the plotters.

William J. Flynn, then Chief of the Service, promptly established a counter-espionage unit in New York, headed by Agent Frank Burke and staffed by 10 picked investigators. Burke was short and stocky, with light brown hair parted in the middle; spectacles rimmed Irish eyes that could twinkle or drill. He was shrewd, bold, and dedicated to his job.

One prominent German put under surveillance in New York City was George Sylvester Viereck, editor of a periodical called *The Fatherland*. Although no direct suspicions centered on Viereck, he was shadowed in the belief that persons active in espionage and propaganda might visit him.

Adventures of the U.S. Secret Service: 2

Other agents were assigned to shadow certain German Embassy officials.

ON SATURDAY, July 24, 1915, Burke sat writing a report at his desk on the top floor of the Custom House at the Battery. From the windows he could look across the shimmering harbor at the Statue of Liberty. Burke was not, however, destined to enjoy the slight breeze that wafted in from the harbor, for a telephone call sent him out on an assignment that was to make history.

The call came from another Secret Service agent, William H. Houghton, whose job it was to keep Viereck under surveillance. Houghton reported that he had followed Viereck to the building at 45 Broadway, owned and occupied by the Hamburg-American Steamship Line, and suggested that Burke join him there in case Viereck emerged with other persons.

Burke joined Houghton immediately, and the pair kept watch on the entrance. Since it was Saturday afternoon, lower Broadway was virtually deserted and the sun-roasted streets were quiet. At three o'clock Viereck came out with another man, who carried a bulging brown-leather briefcase.

Viereck's companion was about 50 years old, tall and slender, with close-cropped graying hair. His cheeks were branded with old dueling scars, and he walked stiffly and ramrod straight in the haughty manner of the Prussian aristocracy.

It would make a better story to say that this stranger had earlier been identified as an important cog in the German propaganda machine and that the Secret Service had been on his trail for weeks. The truth is that neither Burke nor Houghton had ever seen him before, did not know who he was, and had no knowledge of his importance. Only afterwards did they discover that he was Dr. Heinrich Friedrich Albert, Privy Councilor of the German Government, who had entered the United States officially as a commercial attache of the German Embassy.

DR. ALBERT and Viereck walked to the Rector Street elevated station and boarded a northbound Sixth Avenue train. Burke and Houghton boarded the same train. The Germans sat together, and Burke sat down behind them. Albert held his brown bag in his lap. Burke tried to listen to their conversation above the rumble of the train, but they spoke in German.

When the train halted at the 23rd Street station, Viereck said goodby to Dr. Albert and left the car, followed by Agent Houghton. Burke remained to keep an eye on Albert.

Just before the train gates closed at the 23rd Street station a young lady stepped aboard and sat down in the seat vacated by Viereck, next to Dr. Albert, who was closest to the window.



At three o'clock, Viereck came out with another man who carried a bulging briefcase.

BOOK DIGEST : U.S. Secret Service

Apparently Albert was en route to his living quarters at the German Club at 59th Street and Central Park. To get there it was necessary for him to leave the train at 50th Street and take a shuttle train that ran between 50th and 59th Streets. As they rode, Burke noticed that Albert removed the briefcase from his lap and placed it on the seat by the window. The German then took a paper from his coat pocket and began to read.

As the train pulled into the 50th Street station Albert was still reading, and he seemed oblivious to the fact that the train had stopped. Just as it was about ready to move, he glanced out the window, saw the station sign, and realized that this was where he wanted to get off.

He sprang out of the seat and shouted at the train guard, "Wait! Wait! I get off here! I get off!"

As he dashed toward the door, the girl who had sat beside him called out, "Hey, wait! You forgot your briefcase."

Evidently Albert did not hear her, for he ran out of the door and was on the station platform before he suddenly halted and turned, an expression of anxiety on his face. In that instant Burke made a fateful decision. He reached over the back of the seat and seized the briefcase.

"That's mine!" he said to the startled girl. With the case, Burke, noting that Albert was trying to re-enter the car through the rear door, headed for the door at the front end of the car. Albert was having some difficulty, his path barred by a very fat woman who stood in the doorway asking a question of the train guard. When finally the German pushed past her and rushed to his former seat, the girl pointed at the seat in back and said, "The man who was sitting there took the briefcase. He went out the other door."



Burke stuck a cigar in his mouth and pretended to light it.

OTHER passengers had alighted from the train, and Burke made himself as inconspicuous as possible by mingling with them. He saw Albert "come tearing out in a hurry, greatly disturbed." The doctor was between Burke and the exit stairway, and Burke knew it would be folly to make a break for the street at that moment. Instead, he walked calmly to the station wall, stuck a cigar in his mouth and pretended to light it, blowing out one match after another as though the wind were the culprit. With his body he held the precious briefcase tight against the wall, partly covered by his jacket. The train rumbled out of the station.

Albert glanced hurriedly at all the people on the platform, then whirled and rushed down the stairs to the street. There was no other train in sight and Burke figured that it would be disastrous to wait on the platform any longer, so he walked rapidly to the stairway and descended to the sidewalk below.

On the street Burke saw Dr. Albert "with panic on his face," looking at pedestrians in all directions. Suddenly the German saw Burke and the briefcase. He let out a wild yell and dashed in Burke's direction.

Again Burke made a split-second decision. A Sixth Avenue trolley car was approaching, headed uptown. It was one of the open cars then popular, a car with running boards on each side and open seats extending the entire width of the vehicle. Burke jumped on the running board of the moving car, near the conductor. Albert was racing to catch up, shaking a clenched fist and screaming at the top of his lungs.

"See that man?" Burke said to the conductor. "He's crazy—stark, raving mad! He's just stirred up a lot of trouble on the elevated station. If he gets aboard this car you're going to have more headaches than you can handle."

The conductor took one good look at the wild-eyed, fist-shaking, shouting Dr. Albert and decided that Burke was telling the truth. He called loudly to the motorman, "Hey, Joe, step on it! Don't stop, Joe—don't stop!"

The motorman looked back, saw the frantic Albert, and speeded up the car, which soon outdistanced the doctor and turned west on 53rd Street.

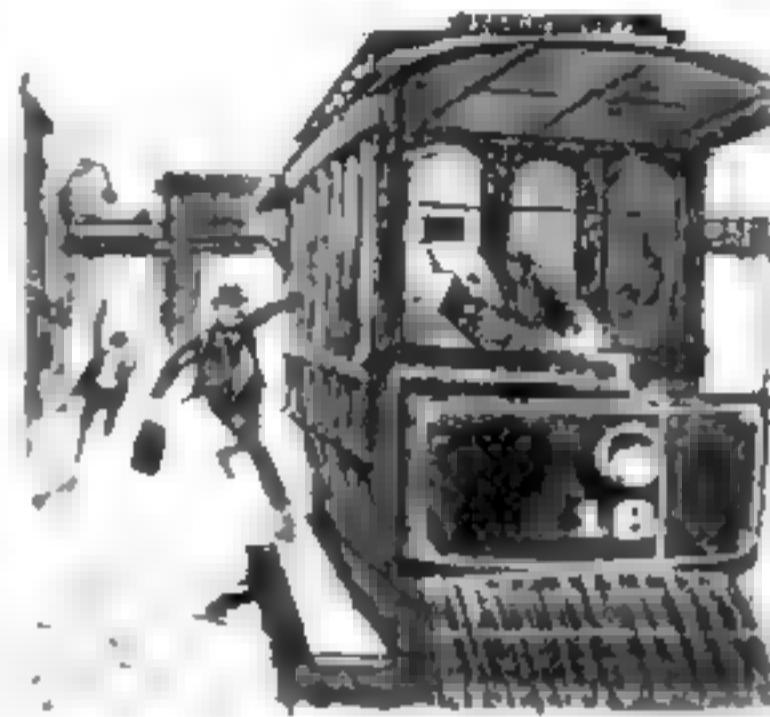
At Eighth Avenue and 53rd Street Burke hopped off and boarded a downtown trolley. A few blocks down he alighted and went to a nearby drug-store, where he telephoned Chief Flynn, then in New York.

Flynn drove to the store in his car, picked up Burke and the briefcase, and went to the Secret Service office in the Custom House. Together they opened the bag. Virtually all the documents it contained were in German, which they could not read. Flynn promptly telephoned Secretary McAdoo, then on vacation at North Haven, Me. McAdoo requested that the case and its contents be brought to him immediately.

Meanwhile, agents reported consternation in the German Embassy in Washington and at 45 Broadway in New York. The Germans suspected that a British spy had seized the briefcase. But apparently they had a weak hope that it had been stolen by an ordinary sneak thief, because on the following Monday a pathetic little advertisement appeared in the *New York Evening Telegraph*. "Lost: On Saturday, on 3:30 Harlem Elevated train, at 50th Street station, brown leather bag, containing documents. Deliver to G. W. Hoffman, 5 East 47th Street, against \$20 reward."

When Flynn and Burke delivered the briefcase to Secretary McAdoo, a translation of the German documents provided incredible revelations of the vast and bold operations of the German propaganda and sabotage machine.

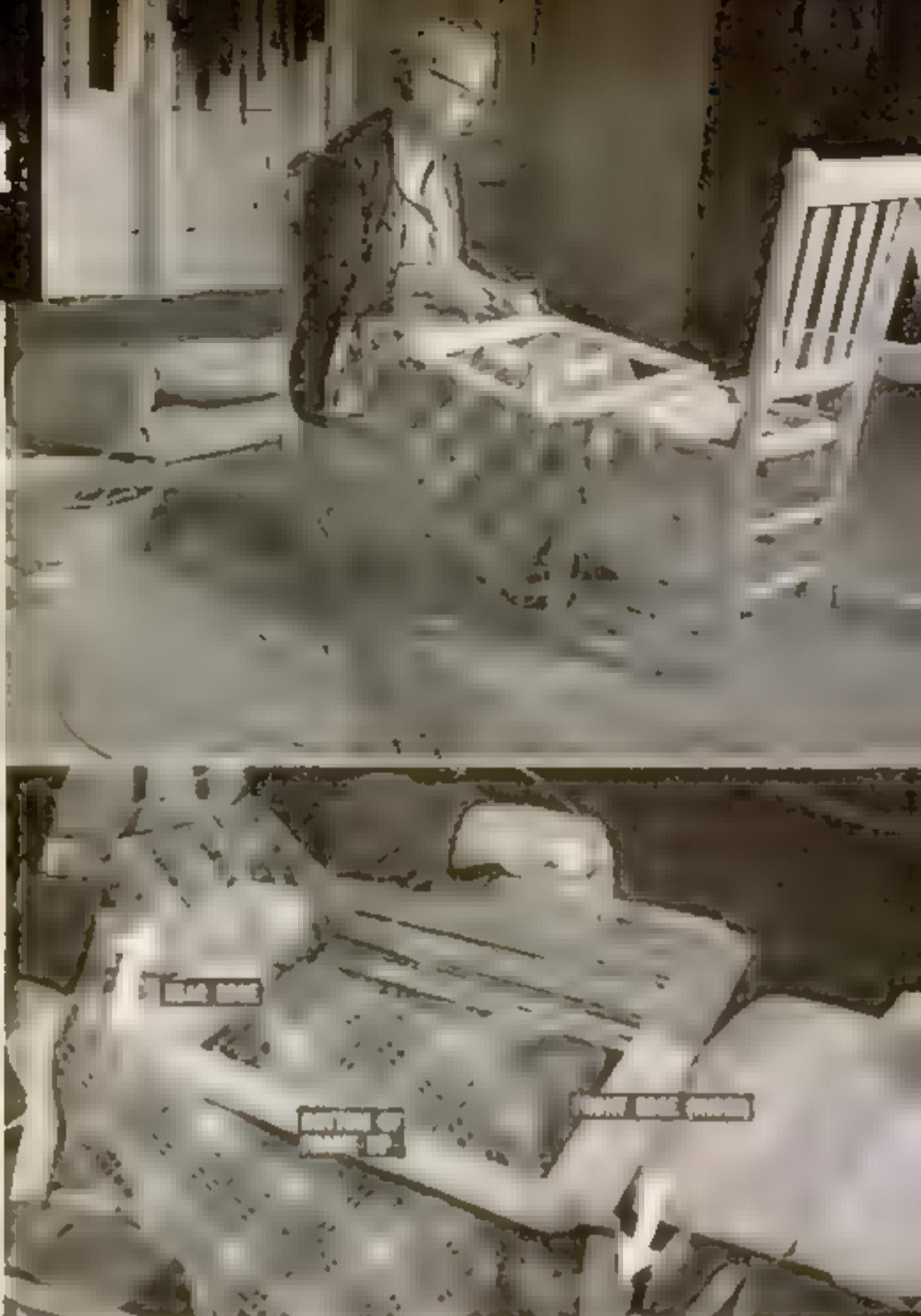
There was indisputable evidence that Albert was the top financial agent of the Imperial German Empire in the United States; a total of \$27 million had been deposited in American banks for his use. The doctor, it appeared,



He jumped on the running board of the moving car . . . Albert was racing to catch up.

Mechanics and Handicraft SECTION

AN EXPERT WEAVER, Mrs. Sadie Robbins, tacks first strand of cane to underside of seat frame to begin warp—the parallel strands of cane into which other strands are woven. One bunch of water-soaked cane is stretched out on floor, while another soaks in tub. Cleat nailed to chair keeps frame from sliding while warping and weaving

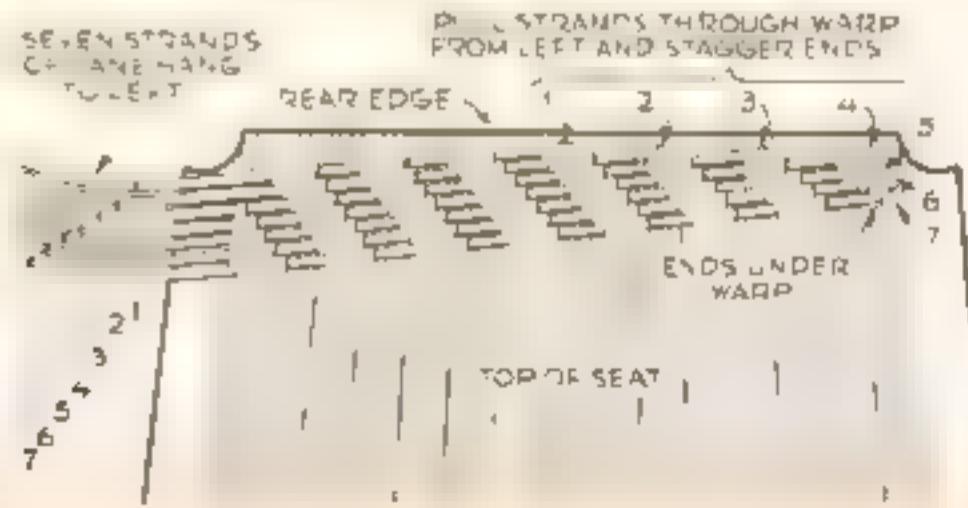


3. FIRST STEP IN WEAVING is the starting of seven strands of cane through the top warp. First strand (arrow) is tucked under nine warp strands, second under eight, and so on



1. TO START THE SEAT, the cane is wrapped around the frame from front to back. Frame is turned end over end (arrow) in photo above, as cane is wrapped around it and pulled taut. Every fifth turn is wrapped around the front

4. USING FOUR-OVER, FOUR-UNDER PATTERN, weave strands to left. Ends of No. 1, 2, and 3 are staggered along rear edge of warp as below. Ends of strands 4 to 7 lie together under wrap.



Weaving Cane for the Kennedy Rocker

...or any favorite antique chair

By Herbert R. Pfister

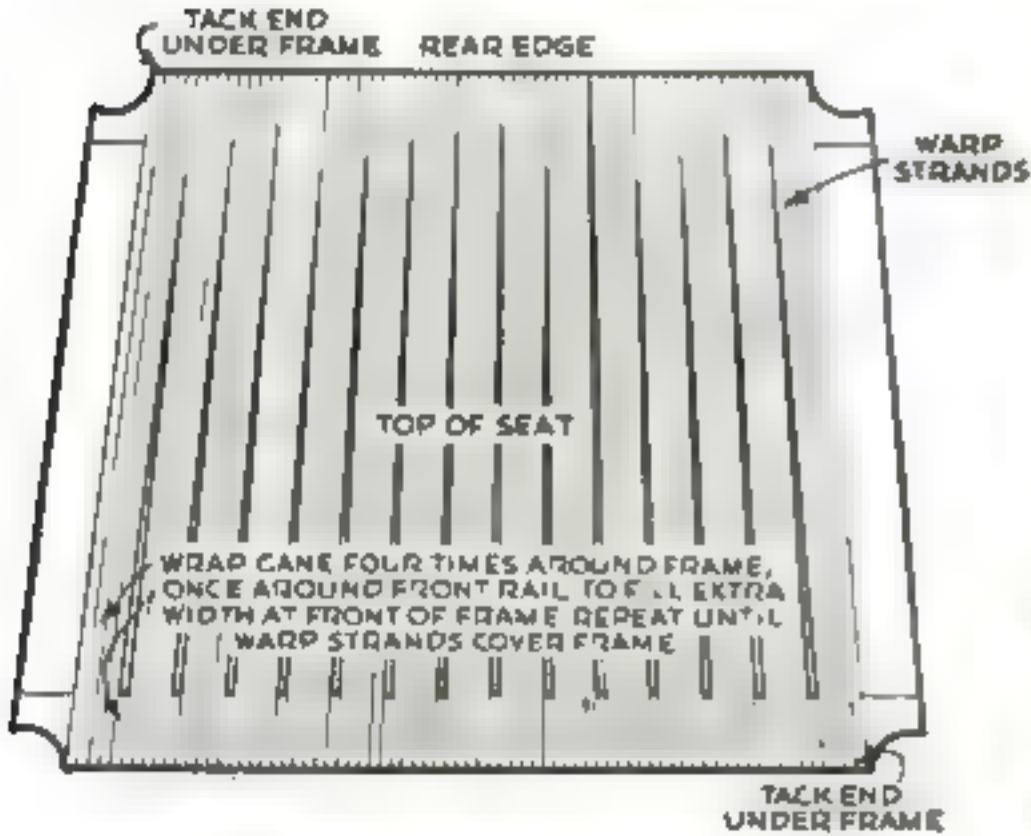
WEAVING cane by hand is an art that has nearly vanished. Only a few skilled weavers now practice their trade in factories similar to the P & P Chair Co. that makes the Ken-

nedy rocker. Some antique restorers also know how, but they get high prices.

So, whether you're building a JFK rocker as described last month, or just want to recane an old chair, knowledge of this almost-forgotten handicraft can be worth real money.

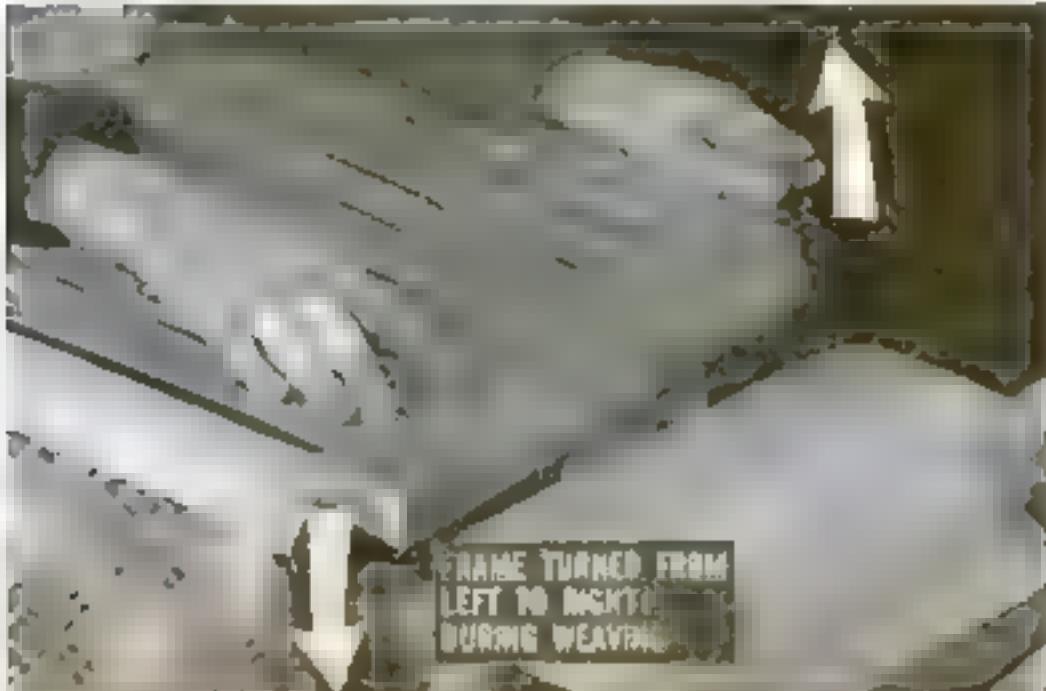
Mrs. Sadie Robbins is one of the ex-

CONTINUED



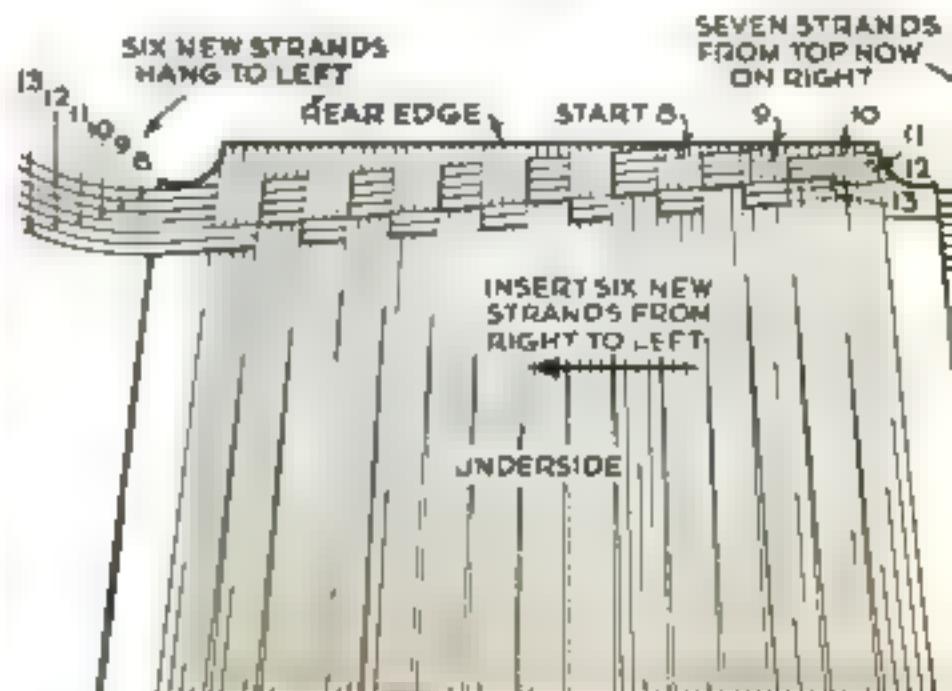
rail to space out the warp along the wider front edge of the frame. These extra turns would not be needed on a square seat, since warp would be uniform along front and rear.

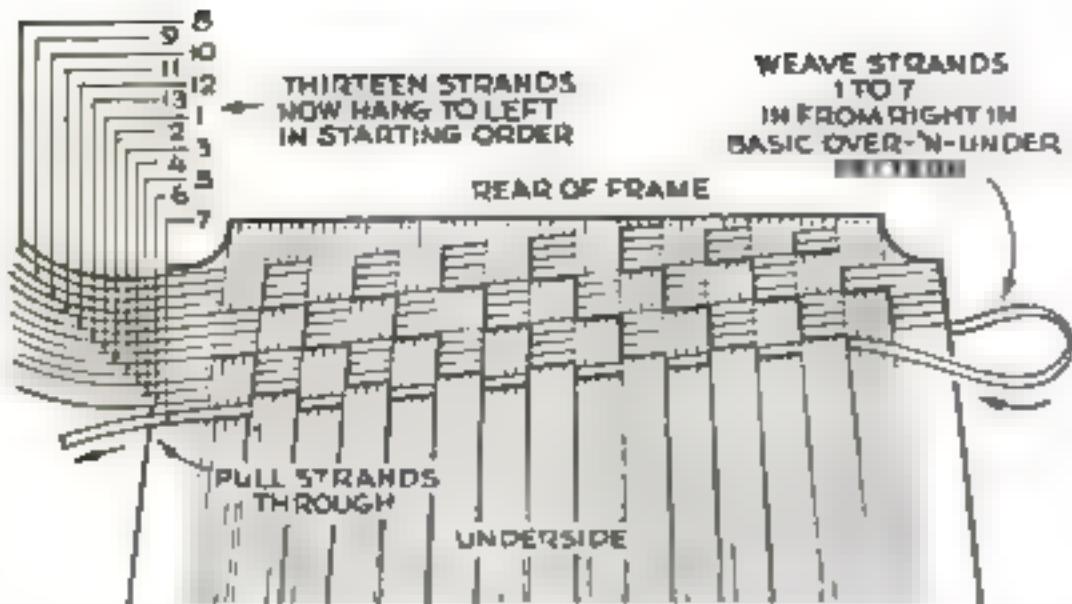
5. STARTING STRANDS ARE PUSHED TOGETHER so that they lie snugly side by side to begin herringbone pattern. Strands 1 to 7 now dangle from left of frame, and frame is turned over.



2. CANE IS TIED TOGETHER to make a single continuous strand around frame. Some knots will be hidden under crossweave. Those that aren't will be untied later and ends tucked in.

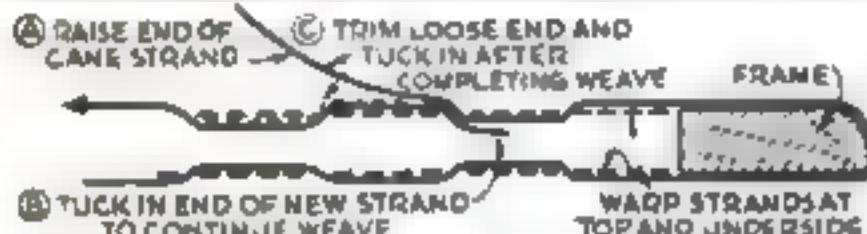
6. WITH FRAME TURNED BOTTOM UP, six new strands—No. 8 to 13—are started into right side of bottom warp, pushed together and pulled to left. Strands now hang from both sides.



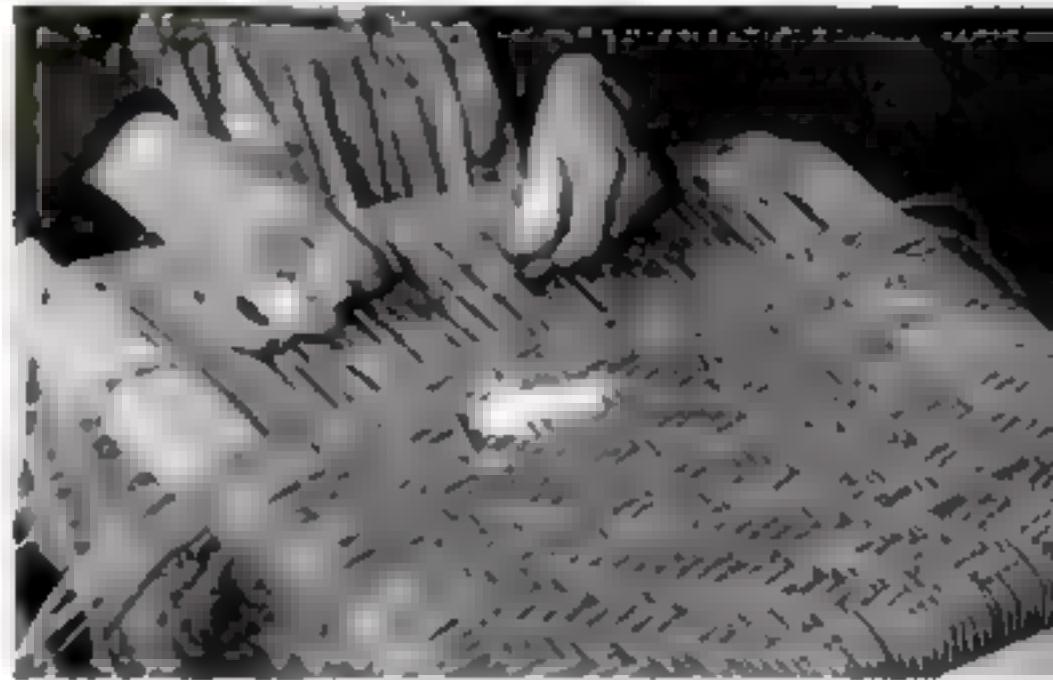


7. STRANDS NO. 1 TO 7 at right side are woven into bottom warp after starting strands 8 to 13. This is a simple "over 'n under" pattern found on seats of many antique chairs. In photo

to above at right, the last strand (No. 7) of the group is being pulled through to the left side. At this point, there will be thirteen strands, numbered in starting orders, at the left side.



10. AT END OF WEAVING STRAND, a new strand (B in insert drawing) is tucked under the end (A) of the strand that has run out, to continue the weave. The old strand end (A) is then trimmed and tucked under the next four warp strands as at (C) to conceal the splice.



11. AS WEAVING NEARS COMPLETION, warp tightens, and a table knife must be used to separate strands. Arrow points to warp knot that has been untied. Ends will be tucked into pattern.



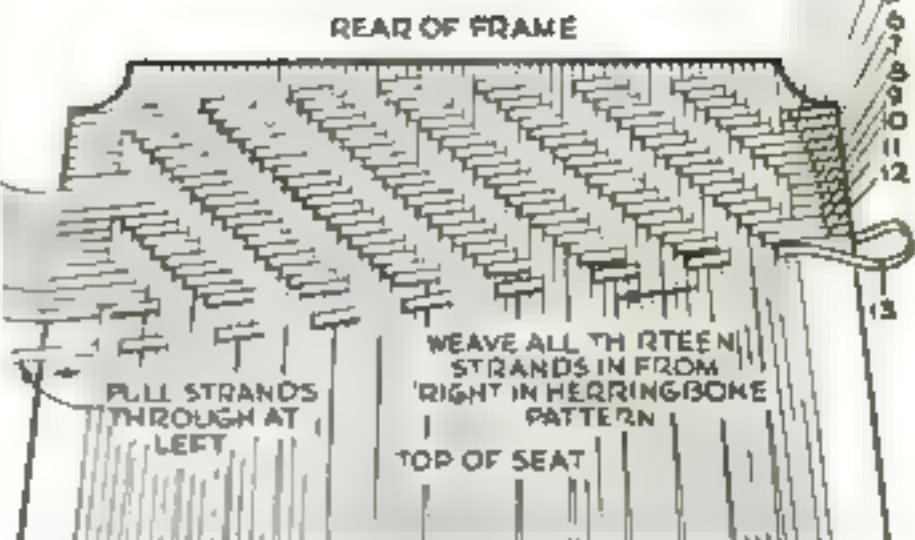
CHANGE NUMBERS
FROM STARTING
ORDER TO WEAVING
ORDER

REAR OF FRAME

2
4
6
8
10
12
3
5
7
9
11
13

DOTTED LINES HELP
TRACE STRANDS
THROUGH BOTTOM WARP
TOP OF SEAT
| FRAME TURNED TOP UP
| ALL STRANDS STARTED
AND READY FOR CONTINUOUS
WEAVING IN NUMBERED ORDER

THIRTEEN
STRANDS
NOW ON
RIGHT



8. FLIPPING FRAME TOP UP swings thirteen dangling strands to right side. Strands shown in preceding drawing have been renumbered 1 to 13; weaving will now be done in that order.

9. STARTING WITH NO. 1, dangling strands are woven in from right and pulled through to left. Above, No. 13 is being pulled through, and herringbone pattern is fully developed.

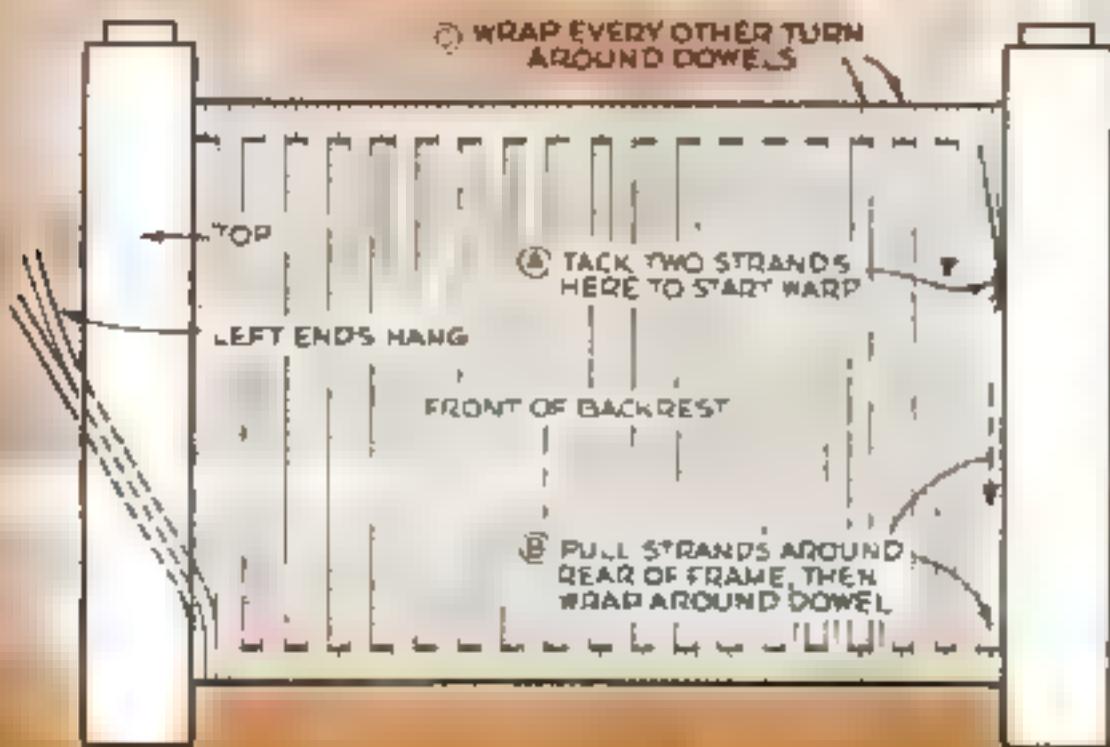


12. AT FINISH OF BOTTOM WEAVE, strands 1 to 6 are pulled through to dangle at left. No. 7 to 10 are cut and ends tucked in at left edge; 11 to 13 are staggered across front edge.

13. THE END: Strands 1 to 6 are woven into front edge of seat top. Ends are cut and staggered along front edge, just as they were staggered along the rear edge at the start.

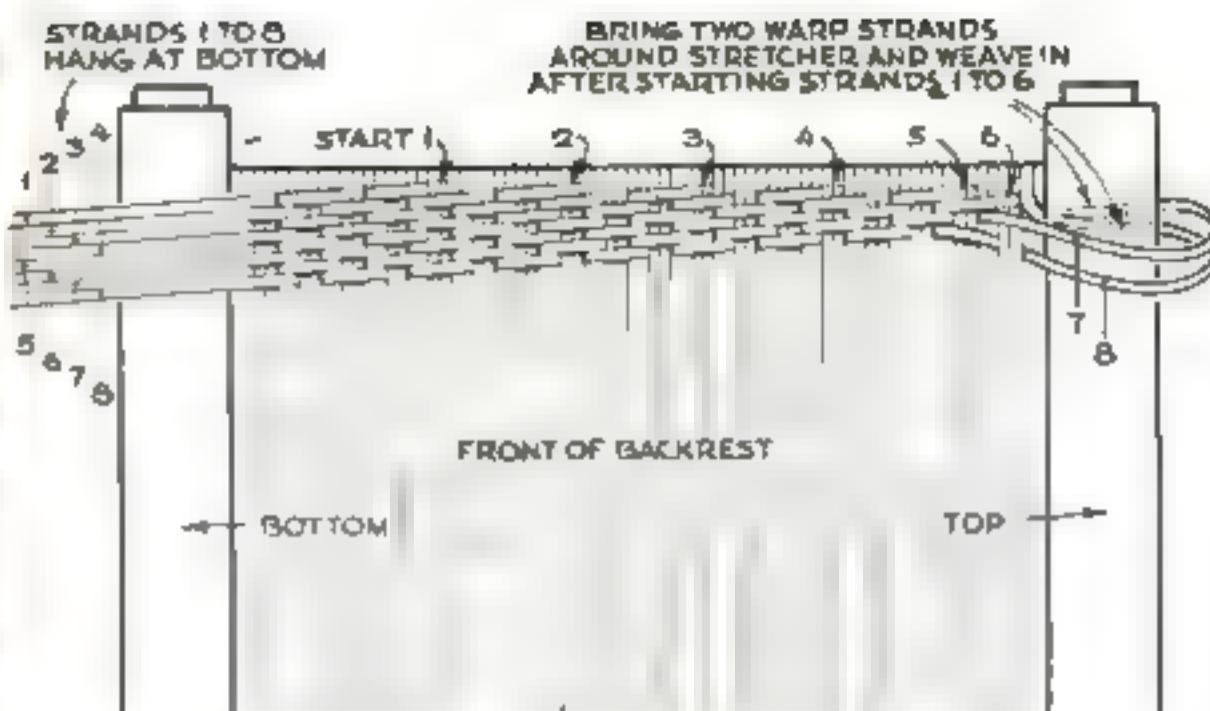
How to weave the backrest

1. WARP IS WRAPPED AROUND FRAME as it was in the seat, except that pattern is different. Two strands of cane are tacked to bottom stretcher (arrow in photo at left) and wrapped first around entire frame, then around dowels at each side. Completed warp is shown in drawing below. Pairs of warp strands are separated by pairs of strands wrapped around dowels. The strand ends hang free at top.



One
Place
You Can
Buy
Cane . . .

... is from Su-Ann, Inc., Box 545, Asheboro, North Carolina. The price is \$2 a bunch, and two bunches are needed to cover the seat and backrest of a JFK rocker.

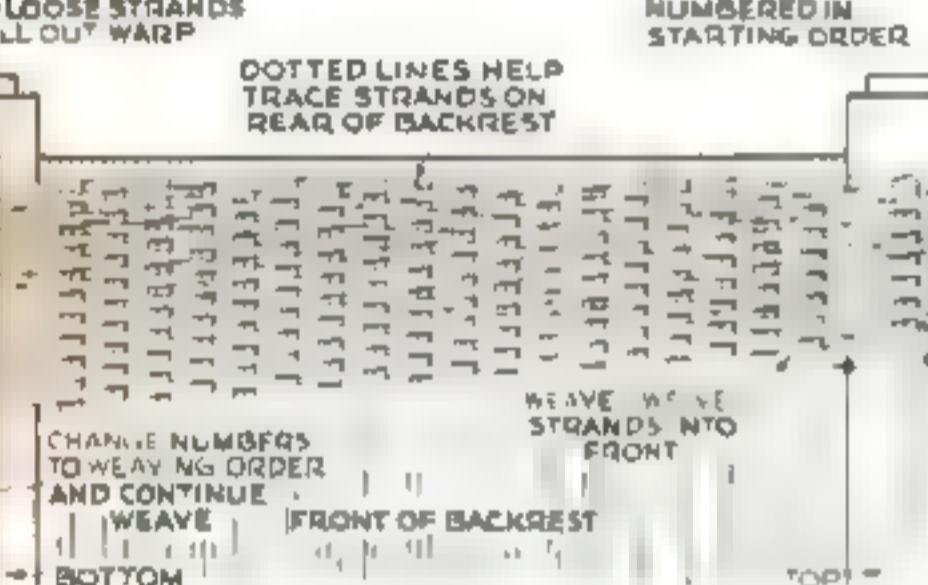


2. WITH BACKREST ACROSS LAP, and front facing up, six strands of cane are woven in from the right and pulled to the left to stagger their ends as shown in the drawing above at right. Then

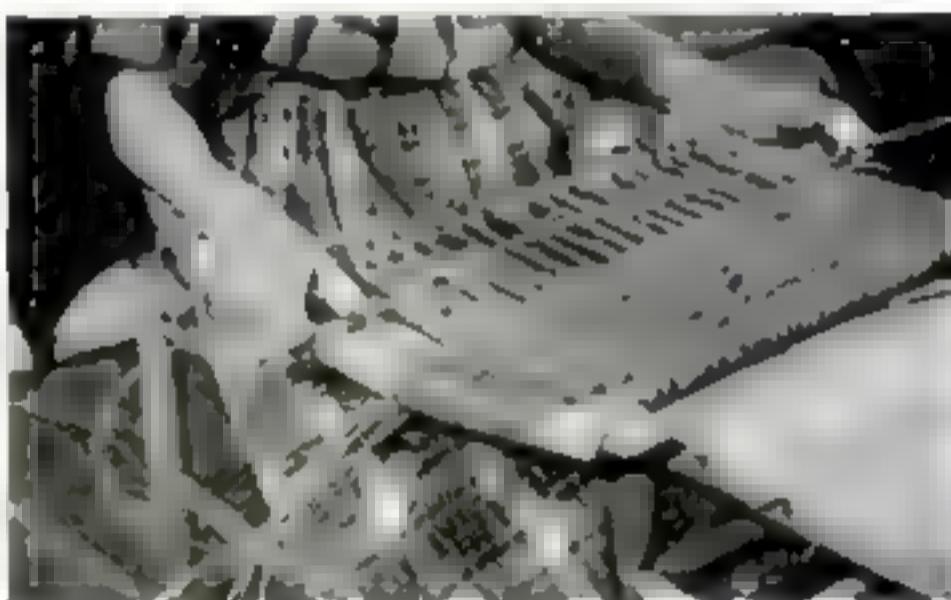
TWO LOOSE STRANDS
FILL OUT WARP

DOTTED LINES HELP
TRACE STRANDS ON
REAR OF BACKREST

NUMBERED IN
STARTING ORDER



3. FRAME IS TURNED AGAIN, and twelve strands from rear are brought around top stretcher and woven into front. Note: Numbers are changed, and weaving continues in order shown.



the two free ends of the warp are wrapped around the top stretcher and woven in beside the starting strands. Eight strands now hang from the bottom of the frame.

6. SAME TWELVE STRANDS are woven into front and rear progressively, until frame is covered. As with seat, new lengths are tucked under ends that run out, to continue strands.

My Most Embarrassing Shop Moment

I HAD just gotten out of high school and was working at my first job in a machine shop. My supervisor was teetering on the brink of insanity trying to teach me the simplest rudiments of shop work.

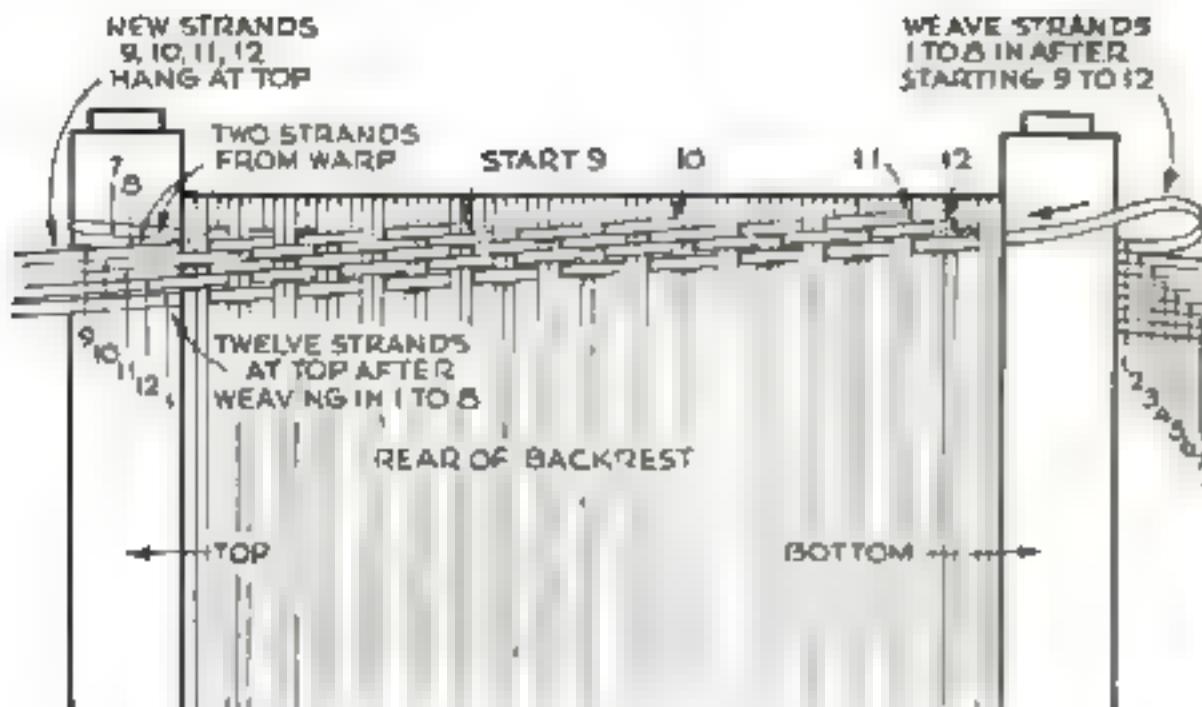
One day he handed me a 150' coil of red rubber air hose and explained he wanted it cut into foot lengths on a saw. To save the time of measuring each piece, he showed me how to saw off one length, then use this as a guide for cutting the others. That was where he made his mistake.

Feeling proud over the new trick I had learned, I raced through the job in only a few minutes. As I neared the end, however, it began to dawn on me that a piece of hose as wide as my fist couldn't be 12" long. I checked the others—I was standing knee-deep in a pile of hose pieces only one of

which was the required 12" in length.

My supervisor wandered over and suddenly turned the color of the red hose. Where, he thundered, was the original piece I was supposed to measure with? I explained that I had used that only for the first cut. I then had used the newly cut second piece to measure the third, the third to measure the fourth, and so on—just as he had said. I hadn't realized that the curvature of the hose had made the inside piece slightly shorter than the outside guide piece laid beside it. Each length thus came out shorter than the preceding one.

I got another chance, though. My supervisor handed me a second coil of hose and a ruler and growled: "This time, measure each piece if it takes you all day."—Steve Haas, Charlotte, N.C.



3. FRAME IS TURNED OVER from left to right, so rear is up and bottom is at right hand. Four new strands are started and staggered along edge, and eight strands from front are woven in.



4. PAIRS OF SHORT, LOOSE STRANDS are tucked into weave and laid across the rear and front face of both stretchers to fill in the blank areas not covered by the warp wrapping.



7. STRANDS ARE CUT AND STAGGERED along edge of frame to end weave. Strands 1 to 6 are ended along edge at rear; No. 7 to 12 are brought around and ended along edge at front.



parts employed by P & P for this job. She's been weaving cane since she was six. Her mother taught her. In the accompanying photos, Mrs. Robbins shows how you can weave cane into the *three different patterns* used in the JFK rocker. Drawings explain in detail how the patterns are formed. You'll very likely find that one of these patterns is precisely the same as the original caning on many old chairs, or so similar that the difference will hardly be noticed.

Cane has a surface like bamboo, but it lacks the joints that make bamboo so easy to recognize. It grows wild in China as a tubular reed, often as tall as 20 feet. The reed is slit lengthwise into strips about $\frac{1}{4}$ " wide and tied into bunches. Each bunch contains enough for an average chair seat. Soaking the cane in water makes it pliable and easy to pull taut.

Starting the pattern is the most difficult part of weaving cane. Once you get the strands started properly, you simply repeat the weaving pattern over and over until the job is done.

Simple tools are used: a tack hammer, a sharp knife for cutting the cane, and a dull one to open the warp and push the woven strands together.

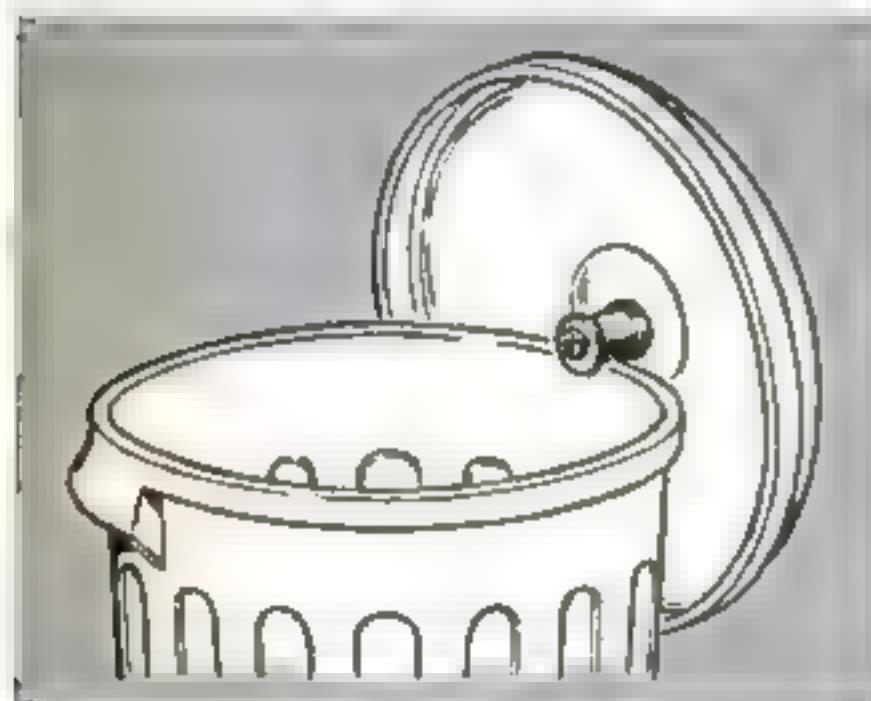
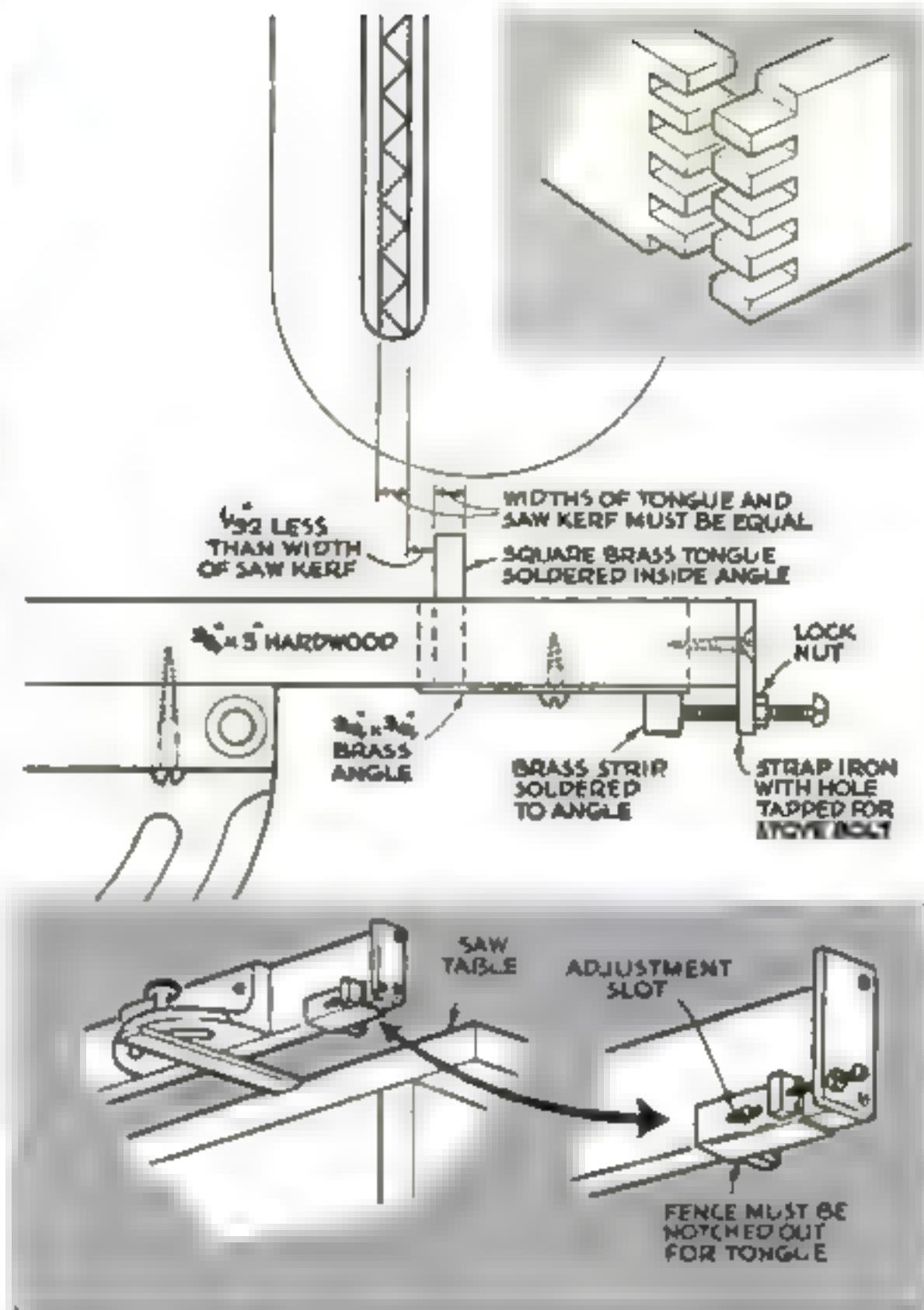
Even with one eye on these pages as you work, you should be able to cover a seat in less than an hour. If the frame is an integral part of the chair, it might take a bit longer—you'll have to turn the chair over repeatedly as you advance the weave across the top and bottom of the seat.

Short Cuts and Tips

FROM THE READERS

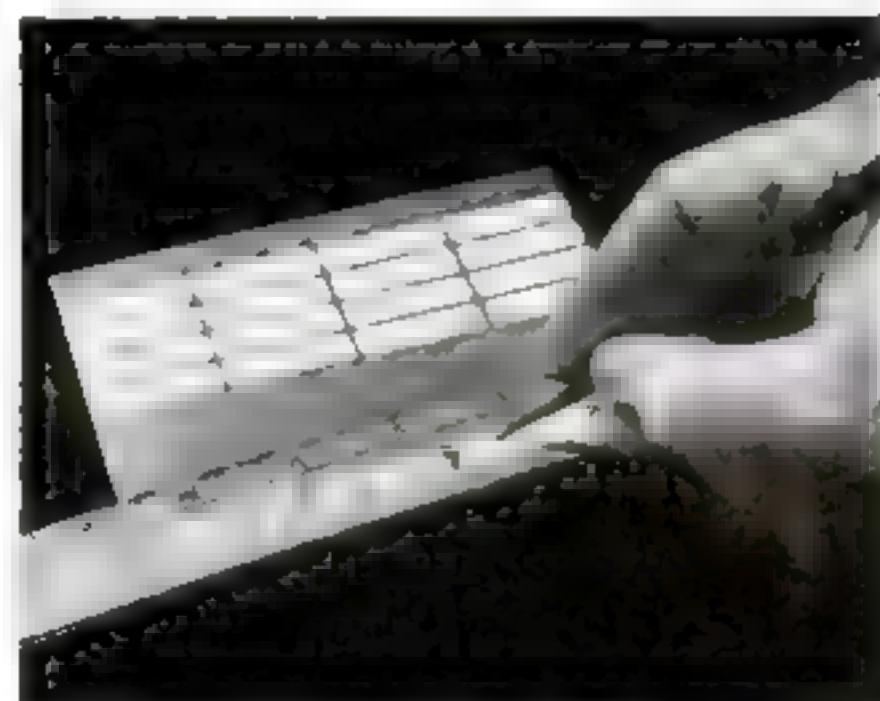
Jig for Cutting Fingerlap Box Joints

MULTIPLE slip joints (so common in wooden boxes) are seldom attempted by the amateur cabinetmaker. Yet they can be cut easily and accurately on a bench saw with this homemade jig. The piece to be cut is set on end and held flat against the hardwood fence that's screwed to the face of the miter gauge. Move the piece against the left side of the projecting tongue and make the first pass. Fit the resulting saw kerf over the tongue and make the second pass, repeating this for the width of the joint. The saw blade or assembly must, of course, make a kerf as wide as the brass tongue. In my jig, the tongue is $\frac{1}{4}$ "-by- $\frac{1}{4}$ ".—A. E. Harrold, Willoughby, Ohio.



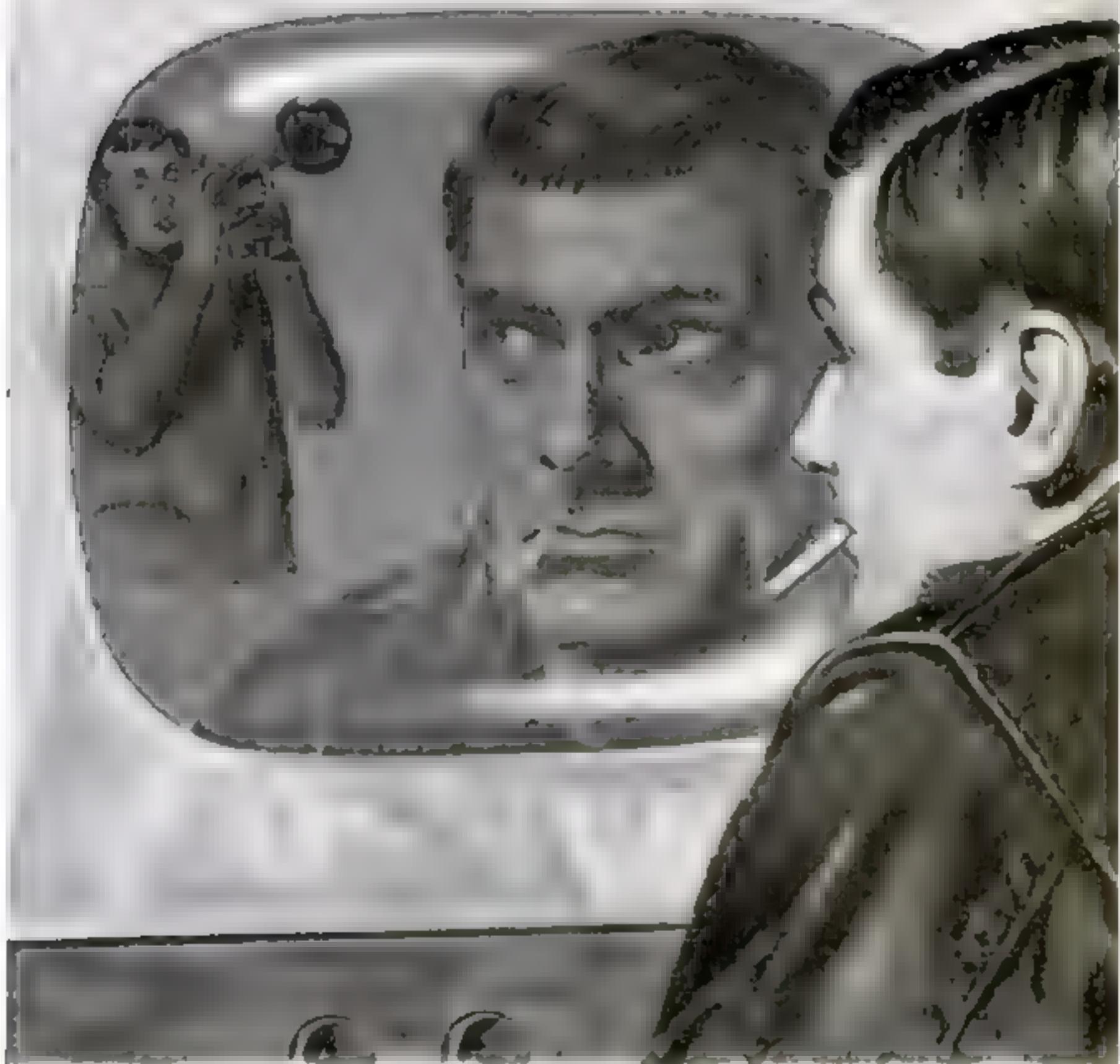
Rim Peg for Garbage-Can Lid

Do you wish for a third hand when it comes to juggling a sack of garbage and the can lid? Bolt a large spool to the underside of the lid, at the center, and you'll be able to hook it over the rim.—G. E. Hendrickson, Argyle, Wis.



Note Tabs on a Yardstick

I'M THE type that has to take a measurement five times unless I jot it down. So I stick paper adhesive tabs on my yardstick. They can be erased or covered with fresh tabs when I'm through with them.—Ken Patterson, Moose Jaw, Sask.



The cat blew another note on his trumpet; the TV screen went blank. He intoned, "Night has just fallen."

On the Trail of No Raster

By Art Margolis

NOTHING seems to trigger more anxiety about the repair bill than a picture tube that remains dark. You turn on the TV, the sound comes in loud and clear, but there is no sign of

light on the screen even when you turn the brightness control all the way up. Unless you know something about TV circuits, your most logical deduction is that the picture tube must be dead. Fortunately for your pocketbook when there's no raster—pattern on the screen—



AN ORDINARY NEON TEST LAMP will indicate the presence of high voltage in your TV. No connection is necessary. Just hold the bulb near the cap of the horizontal-output tube.



ION TRAP is a small permanent magnet clipped around the neck of the picture tube. Improper positioning can cut off brightness. It should be adjusted for maximum brightness.



HIGH-VOLTAGE FUSE may be found either in the high-voltage cage, on the chassis, or under the chassis. If you are getting sound but no brightness, this fuse may be blown.



TROUBLES THAT COME AND GO are often due to tubes with loose elements, intermittent shorts, or intermittent opens. Gently tapping the tubes will usually pinpoint the offender.

the picture tube itself is rarely the trouble.

TV Repair Blues

"SALUTATIONS, man, it's like Big Brother has nodded out—like dead, man."

The bearded young man grabbed my tube caddy in one hand and waved me in the door with a trumpet he held in the other. Sound blared from a battered TV perched on orange crates in one corner. The screen was dark. I turned up the brightness control. Still no raster.

He said, "Told you, Dad. Luminescence quiescent."

I started checking. High voltage and CRT were okay. I rotated the ion trap—not a glimmer. Suddenly there was a loud blast behind me. I spun around. The cat took the trumpet from his lips and announced, "Then there was light."

I looked back at the set and saw the raster shining brightly. The cat blew another note; the screen went blank. He intoned, "Night has just fallen."

I had to laugh, but now I had a pretty good idea of what was wrong. I started tapping tubes with my tube tapper. When I hit the video-output tube, the raster came on.

He blew a note; the raster went off. I hit the tube and it came back on.

He blew another note and off it went.

The video-output tube feeds the TV signal into the picture tube. With no signal, the bias voltage in some sets will be far enough off to cut off the electron stream in the cathode-ray tube. This was one of those sets.

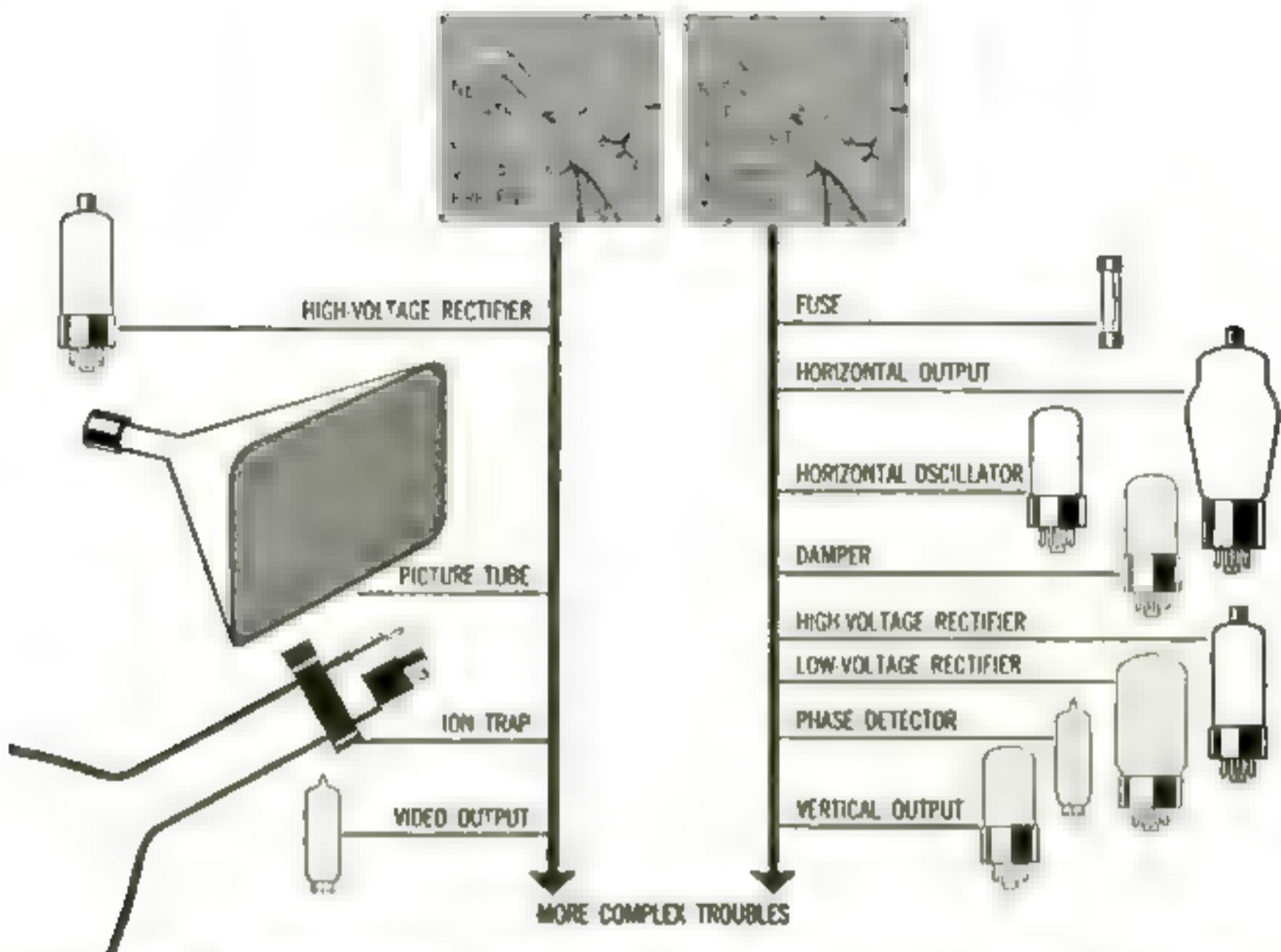
The 6AC7 video-output tube had developed an intermittent short. Any vibration would make or break the short. I replaced the 6AC7. I tapped. The raster stayed on. He blew a couple of notes. It still stayed on.

"You blow a powerful trumpet," I said, starting to repack my tube caddy.

He handed me my tube tapper. "You beat crazy yourself, Daddy-oh."

Mystery of Avery's Aviary

"OUR birds are worried, Art. We've already lost a cockatoo." There was a frantic note in John Avery's greeting. His wife, Mildred, nodded her con-



NO RASTER, BUT SOUND OKAY? The troubleshooting road has two branches. A neon-light test will indicate which to follow. Loss of high voltage is most often the cause of no bright-

ness, and about 75 percent of the time the trouble will be among the first six items shown on right-hand branch. Make substitutions in the sequence shown until raster is restored.

cern as she nervously tucked wisps of hair into a small bun on top of her head.

"I'm sorry, John," I said, "but you must have called me by mistake."

"No mistake," he said. "It's the TV that's upsetting the birds."

One wall of this elderly couple's living room was screened. In a lighted recess behind the screen were about 50 beautiful small birds chattering away.

I turned on the TV. Sound blasted out but no light came on the screen. The birds went into a wild frenzy. I turned down the sound, but the birds still kept up the racket.

John pleaded, "They can't stand it; please turn the set off."

I turned it off, and the birds quieted.

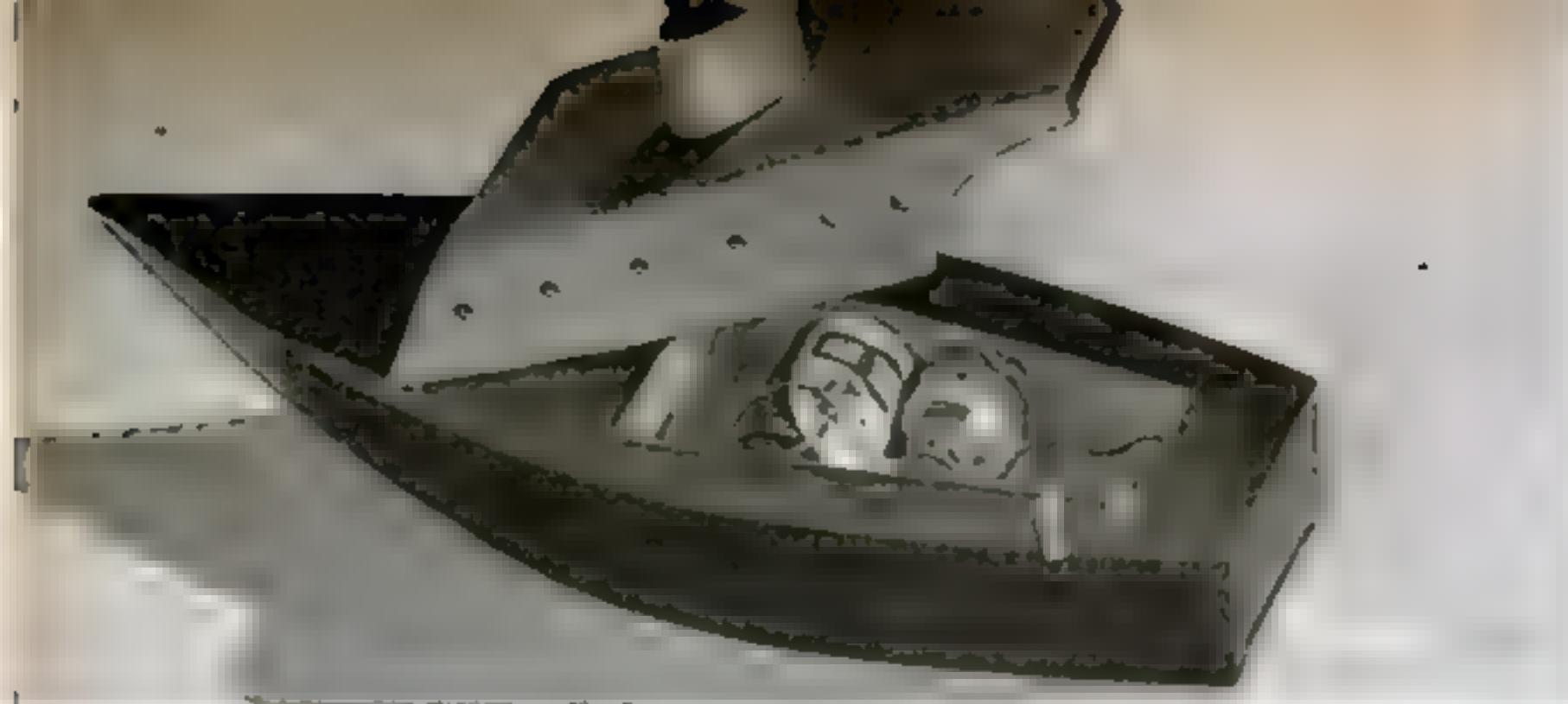
Taking out my neon tester, I held it near the 6BQ6 horizontal-output tube and switched the set on. The neon didn't excite but the birds did. There was no high voltage. Suddenly, I was aware of a chirping from the set. I quickly looked inside. Could a bird have crawled under

the chassis? Then I laughed at myself. There were no feathers on the source of that sound—it was purely electronic.

The horizontal oscillator runs at a frequency of 15,750 cycles per second. In addition to providing the horizontal sweep voltages, it also figures in the manufacture of the high voltage. If you lose it, you lose the high voltage. A circuit called the horizontal phase detector is responsible for keeping the horizontal sweep precisely in step with the transmitted signal. In this set the tube used for the job was a 6AL5. It should have two little filament lights. I looked closely. There were two lights all right, but one was dull and the other overly bright. I pulled the tube.

The chirping stopped. High voltage came on and the birds settled down. Of course the picture was flopping sideways without the control tube. The tube had shorted and caused interruptions in the running of the oscillator at such a rate

[Continued on page 226]



The Model Boat That Flips to Go

By Roy L. Clough Jr.

THIS boat model is guaranteed to drive kibitzers crazy as it sits there in the water. It has no propeller, no paddle wheels, no hidden jet pump, not even a rudder. Yet, when you close a switch mounted on the deck, away it goes, kicking up a wake.

There's no mystery about the basic power source—an electric motor and a dry cell. But how is the thrust applied?

After everybody has had a guess, let them in on the secret. It swims like a whale or porpoise. But its horizontal flipper is transparent plastic, invisible in the water. The flipper is quite efficient, too, and drives the boat about as fast as a conventional propeller.

The boat goes together easily. Cut the sides, transom, and spreader bulkhead from $\frac{1}{16}$ " sheet balsa. Cement the sides together at the stem, bend them over the bulkhead, and secure to the transom with pins and rubber bands. Even up the symmetry and cement on 3"-wide planks for bottom and deck. Cut these pieces a trifle oversize and sand them flush after the glue sets.

Cut the four cabin parts from $\frac{1}{8}$ " sheet. After assembly, hinge the front to the decking with cloth tape. Dope the entire job inside and out with at least two coats.

The driving mechanism is tin-can

stock and $\frac{1}{32}$ " music wire. It consists of a flipper clip pivoting in a mount, and (soldered to the clip) a rocker arm, driven by a connecting rod from a crank disk on the motor. Exact dimensions are not critical as long as the mechanism works freely. Keep the slot in the back of the boat as small as is consistent with smooth operation of the flipper. The rocker holder has teeth that are pushed through the boat bottom and clinched.

Make the connecting rod a bit long. Solder the crank disk to the motor shaft, taking care not to overheat the motor. After cementing the motor to the floor, rotate the shaft so the crank throw is in the maximum forward position, and tilt the rocker arm to its limit of forward travel. Bend the connecting rod at the proper spot to hold this position and slide it into the hole in the rocker arm. Cut the rear bulkhead to size from $\frac{1}{16}$ " balsa and make the vertical slot just large enough to let the connecting rod play without binding.

Solder a couple of pigtails to a D cell; one wire goes directly to the motor, the other has a slide or knife switch inserted. Polarity and direction of rotation are unimportant. A rubber band fastened between two hooks bent from music wire keeps the cell in its cradle.

The boat can be made to circle in either direction by twisting the tip of the flipper to produce a side thrust.

GLUE THIN CARDBOARD AROUND TWO DENT CAL TEAR ROOF SHAPED BLOCKS TO FORM STACK

CABIN TOP
 $2\frac{1}{2}'' \times 6\frac{4}{16}''$

$1\frac{1}{8}'' \times 2\frac{1}{2}''$

USE $\frac{1}{4}$ "-DIA DRILL FOR Portholes

DECKING
 $\frac{1}{16}$ SHEET

TRANSOM
 $1\frac{1}{8}'' \times 2\frac{1}{8}''$

SPREADER
 $1\frac{1}{8}'' \times 2\frac{1}{8}''$

$\frac{1}{8}$ " STEM PIECE - CEMENT ON AND TRIM AFTER ASSEMBLY

SIDE

$10\frac{1}{2}''$

FLIPPER .009 CLEAR SHEET ACETATE

ROCKER ARM

$1\frac{5}{16}$ " BEND

FLAPPER CLIP
 $\frac{3}{16}'' \times 1\frac{1}{8}''$ BEND AND PINCH OVER AXLE

FLAPPER MOUNT

FLAP DOWN

CABIN SIDE - $\frac{1}{16}$ " SQUARES

MEASURE MOTOR OR EQUIVALENT - CUT THEM IN IF ROTATE IN OTHER DIRECTION

CRANK DISK
 $\frac{1}{2}$ " DIA.

$\frac{1}{8}$ " THROW

LWL

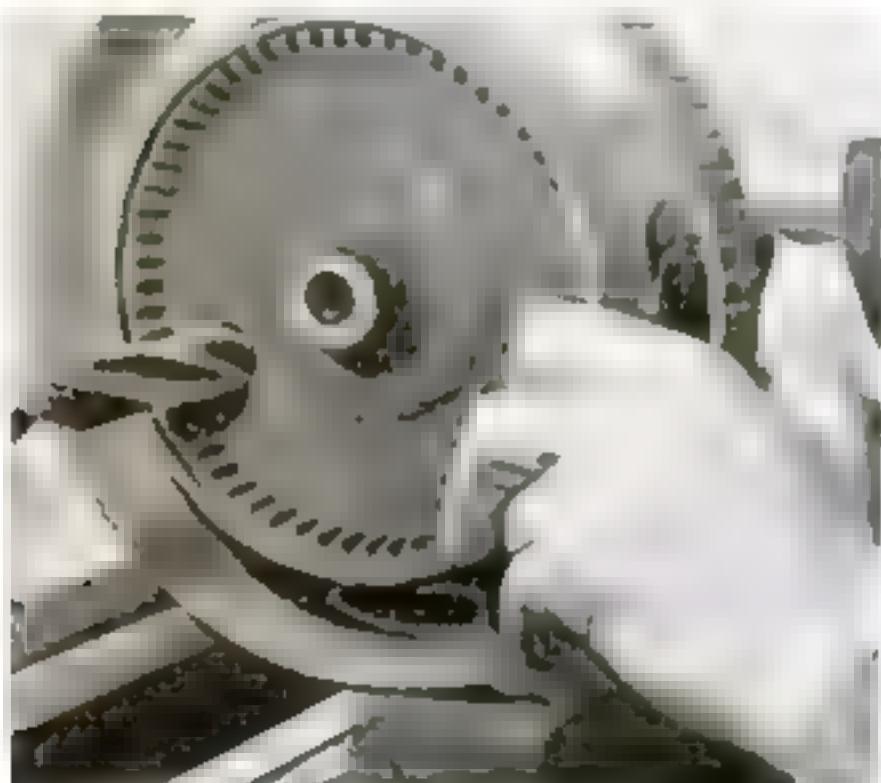
$\frac{1}{16}'' \times \frac{1}{16}''$ BLOCKS



FOR SAFETY, use weed stalks—not your hands—to push material into the revolving blades.



FIRST STEP in conversion is to discard the handle, roller, and pinion gears that drive reel. Wheels will serve as mounting plates.



PIERCE ONE WHEEL with a hole large enough to permit the reel shaft extension to turn freely. A pulley on this shaft is belted to the motor.

Compost Chopper from Old Mower

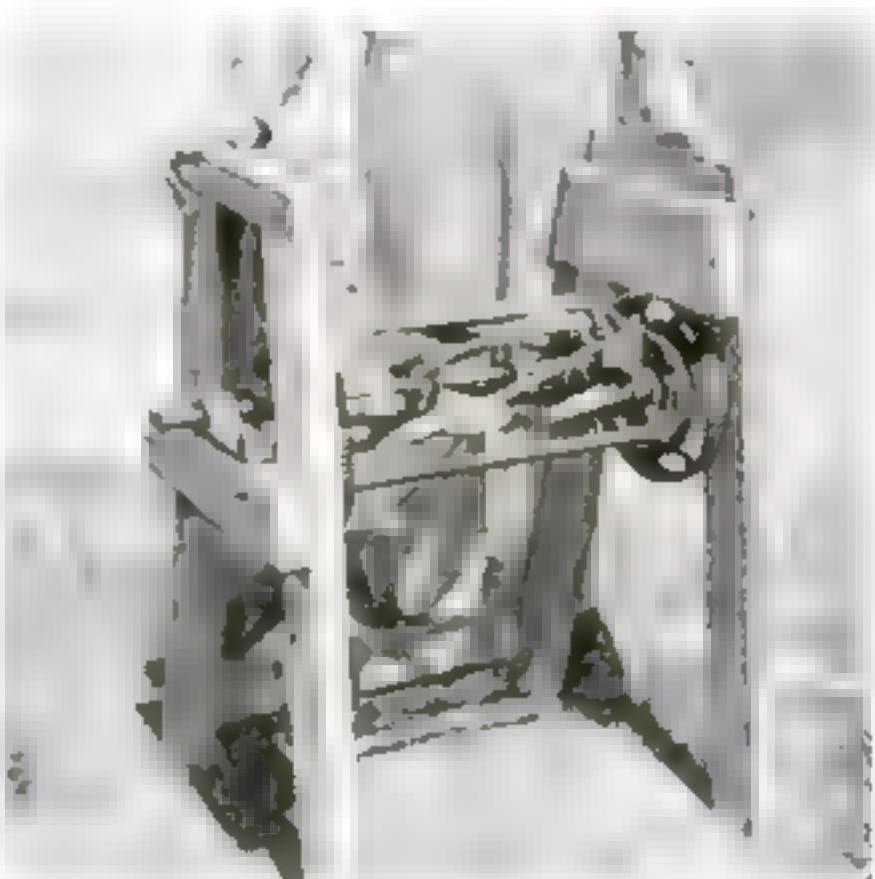
THERE'S no need to do without a compost chopper because the cost is beyond your gardening budget. You can make one from a reel-type lawn mower. If you've bought a power rotary recently, you may still have your old back-buster. If not, pick up a used one.

Chopping up grass, leaves, and vegetation from the garden and flowerbeds shortens the time required to turn this waste material into valuable fertilizer.

Since the power is to be hitched directly to the reel shaft, this shaft must be extended through one wheel (and a pillow-block bearing) so a pulley can be attached at the end. The extension is a steel sleeve, fitted to the shaft by drilling through both and inserting a steel pin. A short piece of rod, the same diameter as the reel shaft, is pinned in the opposite end. Fasten the mower upside down within the frame, bolting the wheels to the legs.

The bottom opening of the wooden hopper should be a little less than the diameter of the reel. Mount the motor on a platform bolted to the frame, aligning the drive pulley with the shaft pulley.

—D. C. Marshall, Manhattan, Kans.



CHOPPER FRAME is made of two-by-fours assembled with screws and bolts. Cross-brace is used at one end only, to support pillow block.

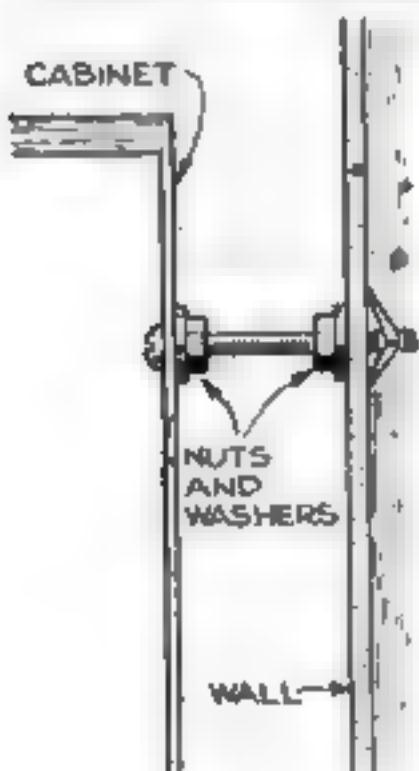


Raincoat for a Radio

Want to tote a transistor into the wilds? To keep it dry, slip it into a plio-film bag (used for frozen foods), twist the neck, double it back, and snap on a rubber band. The film is pliable enough to permit tuning, but won't muffle the sound.—*D. D. Myers, Marion, Ohio.*

►►►To dry a casting line, draw it through a cellulose sponge as you reel it in. First wet the sponge, squeeze it dry, and fold it in half lengthwise. The line will dry in a third of the usual time.—*Ken Murray, Colon, Mich.*

Anchor Standing Cabinets



MANY reasonably tall cabinets or book-cases tend to wobble when the baseboard prevents them from being backed up flat against the wall. Where they're against a hollow wall, you can anchor them with a toggle bolt through the back panel. Turn on two nuts, as shown.—*Harry Sallee, Cleveland, Ohio.*



Depth Gauges for Drill Bits

Bore to preset depths by adjusting these homemade bit stops. For spade-type bits, slot a spool and slip it down over the blade. Turn a screw-eye in at right angles to the shank to position the spool. For twist drills, bore through a short piece of dowel. —*Jerry Beebe, Peru, Ind.*

►►►Do you keep a barrel of rain water standing by at your country place for use in case of fire? Then you've probably had a summer serenade of mosquitoes. A cake of soap dropped into the barrel will keep them from breeding there

Getting Oil into Tight Spots

Why is it that the thirstiest spots are those that are hardest to reach with the spout of your oil-can? You'll have no trouble getting oil to them if you buy a box of flexible drinking straws at the grocery or five-and-ten. They'll bend to any angle and can be discarded later.—*F. C. Gardner, San Angelo, Tex.*



For Better

Here's how to adapt a successful factory painting technique to standard home shop equipment

By John Burroughs

THREE'S nothing tricky about hot-paint spraying. It's just a matter of heating ordinary paint before you use it in an ordinary shop spray gun.

When you spray paint hot, you can build up a heavier, smoother, glossier finish with fewer coats. Hot-spraying virtually eliminates runs, sags, pinholes, thin spots, blushing, or orange-peel. That's why hot-sprayed finishes are now so widely used in industry—for finishing products ranging from Lincoln Continentals to toilet seats.

More paint per pint. Production-line hot-spray guns are expensive. But they are based on a simple idea—heating the paint to lower its viscosity. When the paint is heated, it's not necessary to dilute it with volatile solvent. Hot-sprayed paint, therefore, has a higher solids content.

Try a quick experiment: Heat a can of heavy-bodied enamel in an electric frying pan. As it heats, stir it with an inexpensive candy-making thermometer to check temperature.

Heated to around 125 degrees, the sirupy enamel will thin to approximately the viscosity of No. 20 SAE motor oil, ordinarily proper spraying consistency.

TESTING SAMPLES at different temperatures, as below, is a good idea before you try to hot-spray a brand of paint with which you aren't familiar.



HEAT THE PAINT in the kitchen oven with the thermostat set at 150 degrees. Shake the can from time to time as it heats. Or you can heat it in a water-filled skillet (below), checking heat with a candy-making thermometer.



Finishes, Spray 'Em Hot

Further heating, to roughly 150 degrees, thins it even more. Yet the important properties of the paint—its drying time, coverage, gloss, and color retention—aren't adversely affected.

Watch the heat. Don't let ordinary resin-based paints get much hotter than 150 degrees. According to textbooks, it's possible to heat most paints to around 180 without ruining them. But in using improvised heating equipment, 150 allows a margin of safety. Nearly all oil-based, alkyd-based, and synthetic-resin-based paints and varnishes when heated to 150 can be sprayed without added thinner in shop spray guns that pump up perhaps 30 p.s.i. air pressure.

You're not limited to "ordinary" paint, of course. Heating the material, you can also spray cellulose-based industrial lacquers—the same lacquers used in commercial finishing operations. But there'd be little point in heating water-mixed paints. And don't try to hot-spray epoxy-based paints or others that come with a separate catalyst.

The paint can be heated satisfactorily with nearly any electric kitchen utensil that has a built-in heating element. You can even use an open-element hotplate if you set the can of paint in water.

Or you can use your kitchen oven; its accurate temperature control will do a first-rate job. Set the thermostat at 150

degrees and allow adequate time for the paint to heat through. Open the can and mix pigment and vehicle thoroughly before heating it. Replace the lid tightly.

Heating tightly closed cans of paint to 150 in an oven is perfectly safe. Using a hotplate with an exposed electric element in an area in which you're spraying, however, can be dangerous. Even though hot-spraying produces less flammable vapor than does cold-spraying paint diluted with thinner, remember to observe safety precautions.

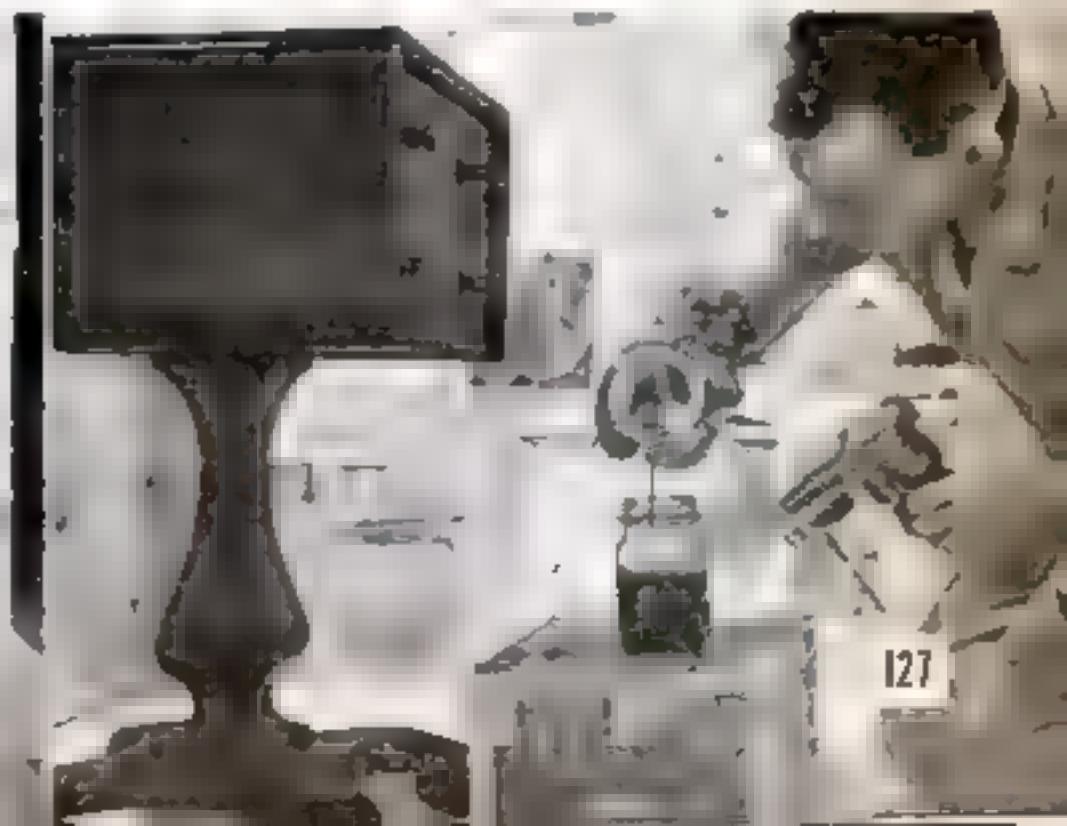
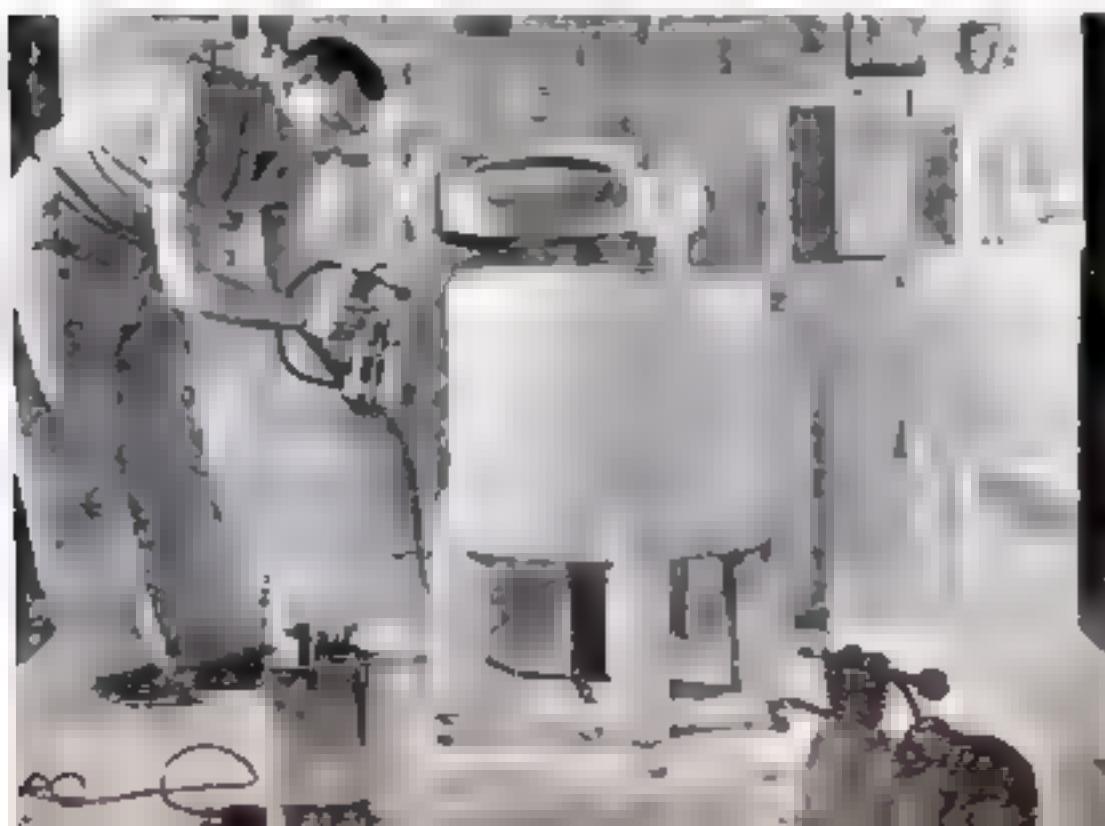
Keeping the paint hot. On small jobs, this isn't the problem it might seem. A nearly full quart cup of 150-degree paint will hold heat long enough to allow you to spray a good-size object. If you're using an aluminum spray gun, warm it before pouring hot paint into the cup.

To delay cooling of the paint between passes at the work, rest the gun on an electric trivet or in hot water; or wrap the cup with sheet-asbestos insulation.

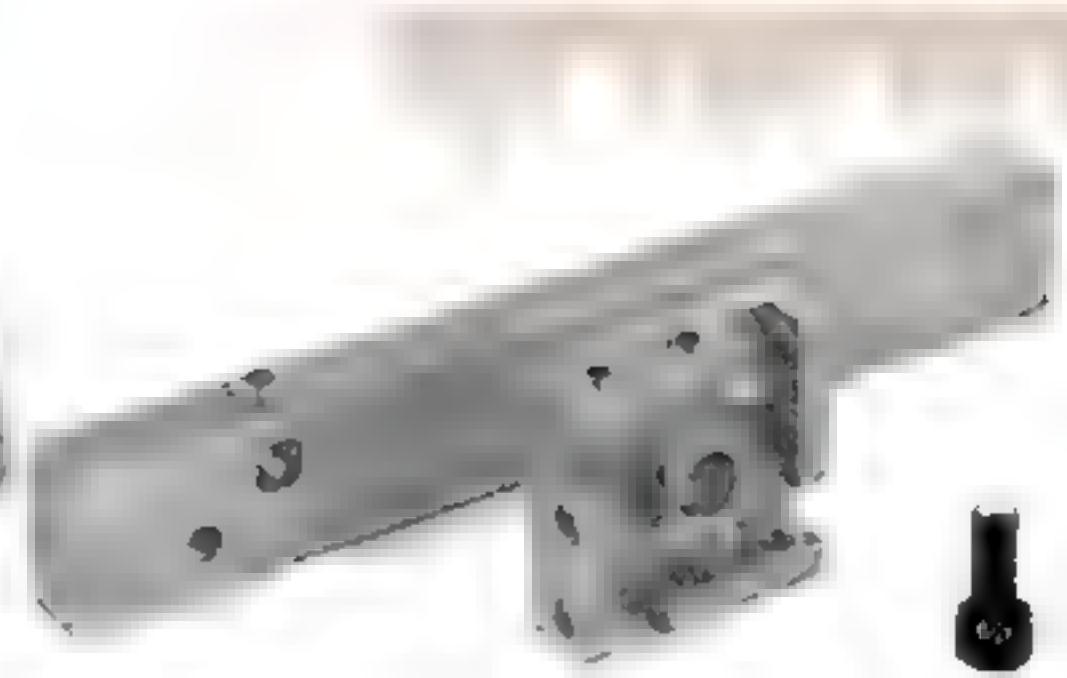
If you want to keep the paint in the gun hot for extended periods—as you would if you were hot-spraying a car—wrap the paint cup with lead or plastic-covered heat cable, the sort used to protect pipes from freezing. A cable with a thermostat is preferable, but one without a thermostat that heats to about 150 degrees will serve. Bind the cable to the paint cup with fiber-glass tape.

KEEPING THE PAINT HOT while you spray is easily solved by setting the can in container of hot water. Two coats of refrigerator enamel made the washing machine below look like new.

VIBRATOR SPRAYER will handle a heavy-bodied varnish without any thinning if you heat the varnish first. Thus you can avoid runs and sags.



One MACHINIST tells another...



PARTS OF THE TURRET are shown here left to right: locator pin, tool shank, turret head, and pivot bolt.

...MiniTurret Head for Your

WITH this miniature lathe turret head you can avoid the bother of frequent tool changes when turning out small, odd-shaped parts. Though simply made, it is accurate enough for use in my regular work as a toolmaker.

Cut the tool shank from $\frac{3}{8}$ "-by- $\frac{3}{4}$ " cold-rolled steel. Using a #19 drill, drill and tap the two holes for 10-32 screws as shown in the drawing. Drill a $\frac{1}{2}$ " hole first for the locator pin; then finish to size with a $\frac{1}{4}$ " drill. Use light feed and cutting oil for a good finish.

Mill or saw the turret head from $\frac{3}{8}$ " flat cold-rolled steel. Square this piece carefully. Mill the tool-holding slots,

keeping them all parallel to the edges.

Carefully mark and prick-punch the pivot-hole location. Drill $\frac{5}{16}$ " and finish-drill $\frac{3}{16}$ ". Counterbore $\frac{1}{4}$ " with a flat-bottomed $\frac{1}{8}$ " drill. Drill and tap the eight setscrew holes.

Cut off a 10-32-by-1" socket-head cap screw to make the pivot bolt. Turn the locator pin from $\frac{3}{8}$ " steel rod. File a flat as shown.

Assemble the tool, align the top edge of the turret head exactly parallel to the top of the shank, and clamp in place by tightening the pivot bolt. Using the $\frac{1}{4}$ " hole in the shank as a drill guide, spot-drill (don't drill through) the turret for



Mandrel Holds Washers

HERE's an easy way to tool up for holding washers when you want to turn down the outside diameter. With a taper mandrel, a loose bushing of proper length, and a ball-bearing pipe center, work can be held tightly and yet be unloaded quickly. The bushing should be long enough so that the center contacts it rather than the mandrel. The work is held by pressure from the tailstock exerted through the bushing against the washer.—H. J. Gerber, Stillwater, Okla.



MACHINE TURRET and tool shank from flat rolled steel. Dimensions are for $\frac{1}{4}$ " tool bits.

ANY ONE OF FOUR CUTTERS can be quickly brought into use simply by rotating the turret.

Lathe Saves Time

the locator hole. Repeat for the remaining three locator holes. Disassemble and drill through the holes with a ± 10 drill.

Degrease and case-harden turret head, shank, and locator pin. (Leave the pivot bolt unhardened.) After hardening, clean all threads and polish the locator pin.

Reassemble the tool. Screw the detent setscrew into the shank deep enough to engage the flat on the locator pin and act as a withdrawal stop without hindering free sliding action. Any of the tool bits can be brought into position by withdrawing the locator pin, turning the turret head, and sliding the pin to lock position.—*Norm Fried, Los Angeles.*

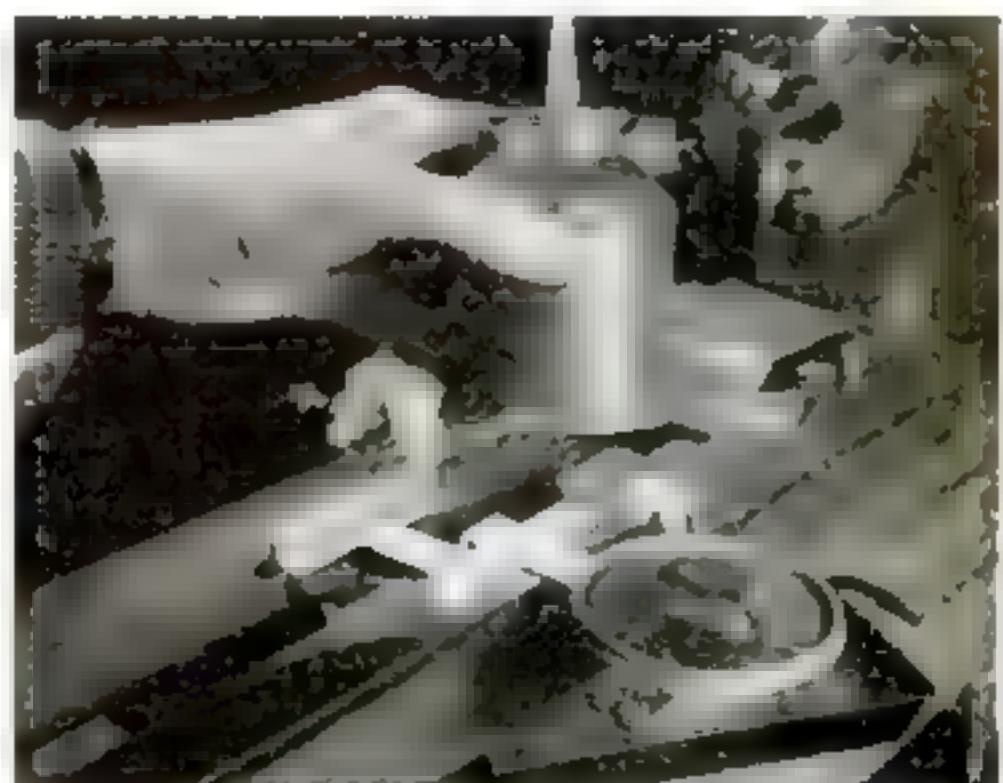


TOOL BITS are ground to keep cutting edges identical in height when turret is rotated.

Rack Keeps Oil Handy

CUTTING oil is always in reach with the oilcan on this holder. It can be slid along the lathe right behind the tailstock.

A clean paint-can lid, turned upside down, is riveted to a bracket shaped to fit the lathe ways and hooked under the rear of the front one. Aluminum is the best material as it will not scratch the ways. Rivet guides at right angles as shown and cement felt pads where the bracket touches the ways.—*Harry Walton, White Plains, N. Y.*



One MACHINIST tells another... (cont.)



Collet Holds Square Stock in Three-Jaw Chuck

INSTEAD of switching chucks, save time with a simple collet that holds square stock in a three-jaw chuck.

Chuck a scrap of round stock three to five times as long as the size of the square stock across flats. Make a centerpunch mark at the No. 1 jaw. Drill through undersize for the square stock. Remove

and mark for three cuts 120 degrees apart. Hacksaw one through and the other two about halfway, as shown.

Rechuck with the mark at the No. 1 jaw, tighten chuck moderately, and bore to a close fit for the square stock. Insert stock with one flat bridging the through cut and tighten the chuck firmly.



Dowel Pins Increase Vise Capacity

You can enlarge the capacity of any machine vise by this simple alteration; it often saves clamping oversize jobs directly to the machine table. However, I recommend it only for light-duty milling jobs, or easily cut materials such as aluminum or brass.

Drill and ream the vise body and sliding jaw for four hardened-steel dowel pins. Drill air-escape holes into the sides to meet dowel holes. Lap dowel holes slightly after reaming to provide a snug, slip fit on the pins.—H. J. Gerber, Stillwater, Okla.

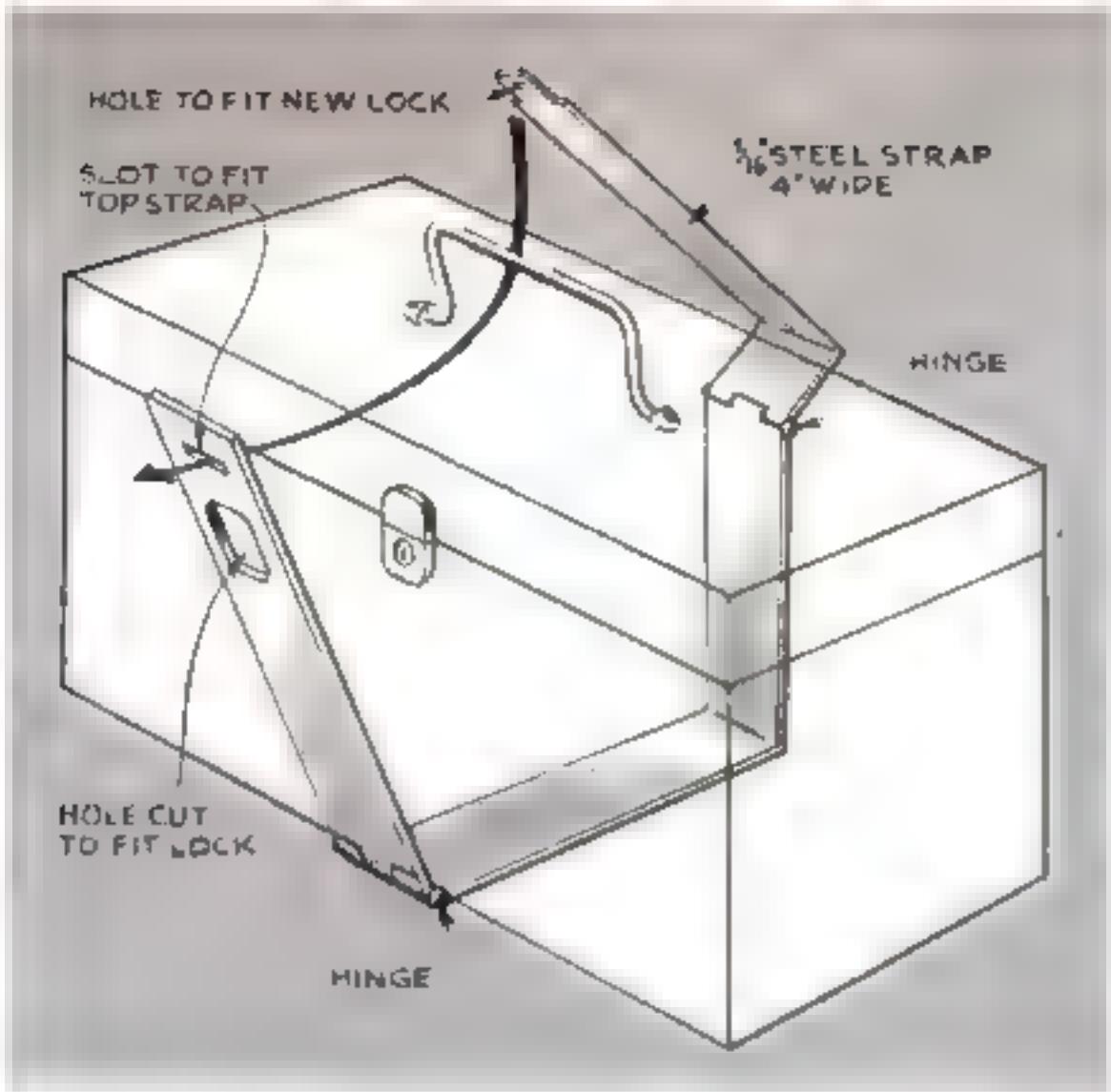
Easy Way to Turn Small Rods

TURNING down long, thin rods is no longer a problem since I started using this system. Turn a section of the rod about $\frac{1}{2}$ " long to the desired diameter by working close to the chuck and taking light cuts. Reverse the tool holder and chuck a drill of a size for a running fit on the finished diameter of the rod. Run the carriage up and drill through the tool holder (a piece of bar stock can be used instead).

Clamp a tool bit to the holder as shown at right so that the cutting edge is in line with the edge of the hole. Rechuck the workpiece and insert the turned-down part in the hole. Use plenty

of lubricant and start the feed. You'll find that about the only limitation on this system is the ability of the rod to withstand cutting torque without twisting.—W. B. Rasmussen, Prosser, Wash.





Short Cuts and Tips

FROM THE READERS

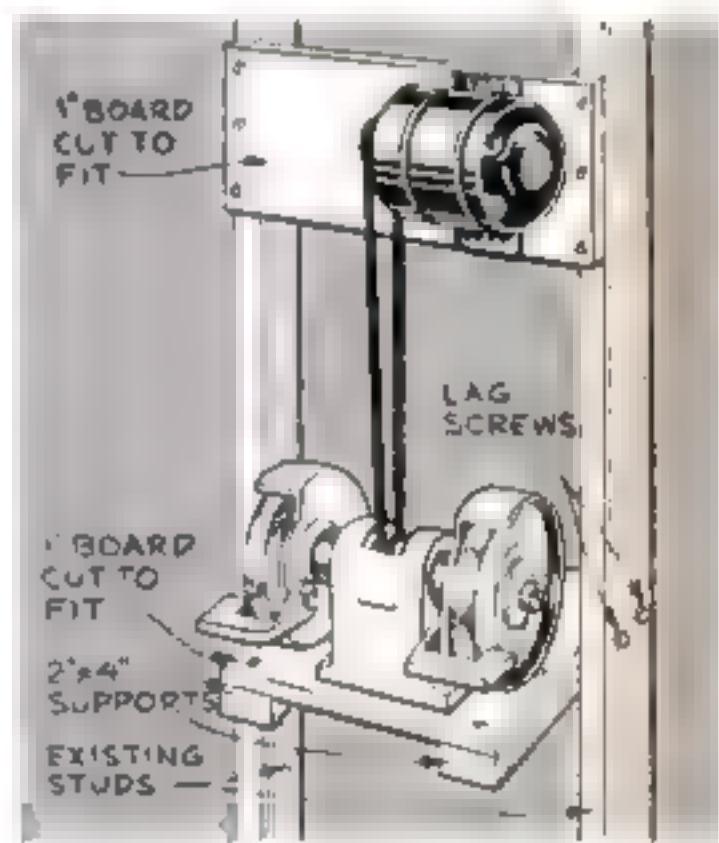
Safety Lock for Metal Toolbox

As a machinist, I leave hundreds of dollars worth of tools in the shop. Though they're in a regular machinist's toolbox, the cheap lock can easily be forced. To avoid thefts, I made this double-hinged guard of stainless-steel strap. It fits over the protruding lock and under the handle, so it can't be slipped off. A good padlock makes the toolbox jummyproof.—*Joseph Skiscum, Harvey, Ill.*

Installing a Grinder in Cramped Space

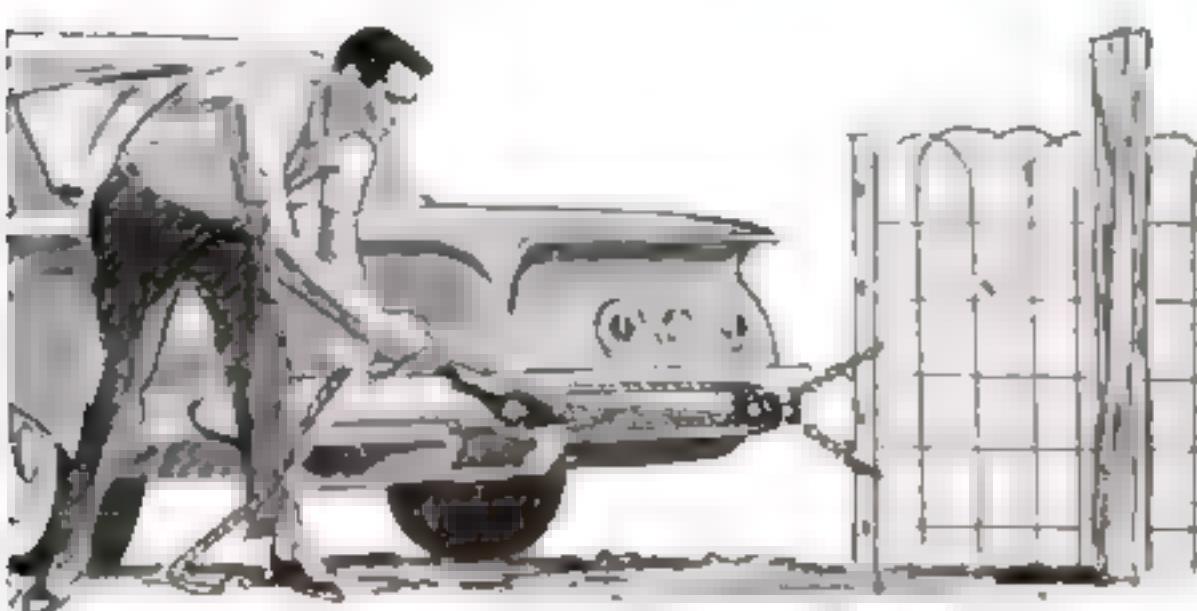
SINCE my workshop is my garage, I have a real space problem. I needed a grinder, but there was no room for another tool stand. So I mounted it on a platform fastened between the wall studs at a convenient work height. I bolted a 1/4-hp. motor to a board secured above the platform—spaced to suit a V belt I had on hand. Mounting slots in the motor base permit adjustment for belt tension. There's still plenty of room for the car.—*Boris Starr, Sun Valley, Calif.*

►►►A CLOTHES brush is more likely to be used if it's kept within sight and reach. Put a screw-eye at the tip of its handle and hang it from a cup hook at the middle of the closet pole. You can't miss it.—*Ken Murray, Colon, Mich.*



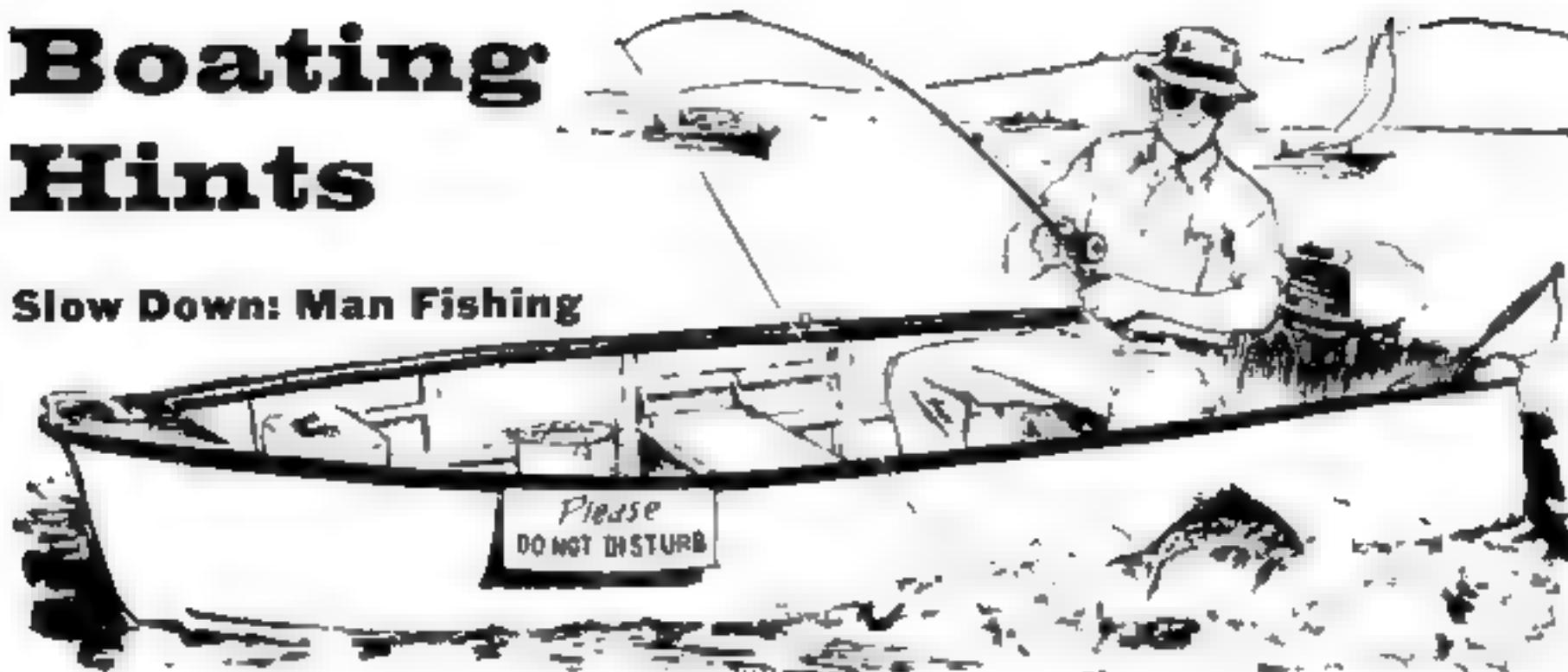
Use Car to Anchor a Fence Stretcher

WHEN stretching wire fence around your yard, you don't have to go to the trouble of setting a heavy post in order to anchor the fence stretcher. Just back your car within a few feet of the wire span and attach the stretcher securely to the frame of the automobile.—*John N. Shockley Jr., Nashville, Tenn.*



Boating Hints

Slow Down: Man Fishing



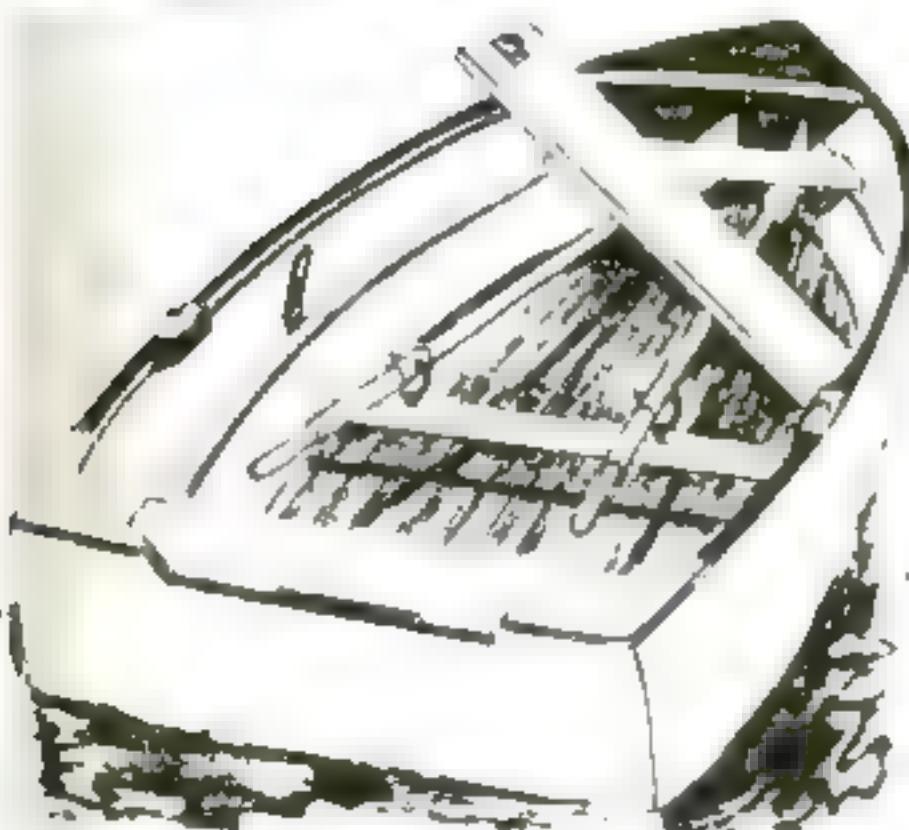
TAKE along a "Do Not Disturb" sign from a hotel. Hang it on the boat and others will know you're more interested

in fishing than in aquabatics or boat racing. The trick is always effective because it brings a smile



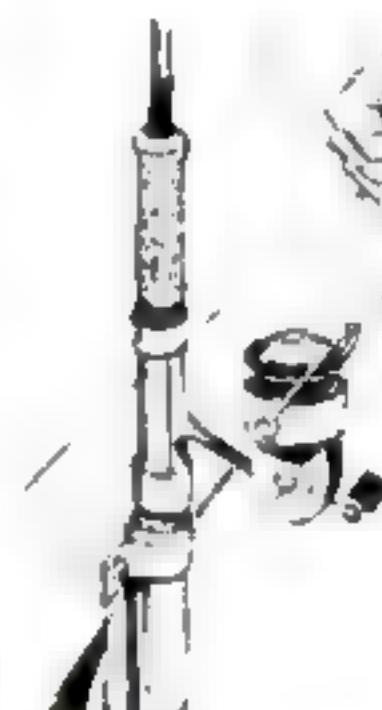
A Cushion for the Fuel Can

THE usual outboard gas can tends to mar the bottom of a boat. One way to prevent it: Slit a piece of garden hose and slip it over the can's bottom edge.



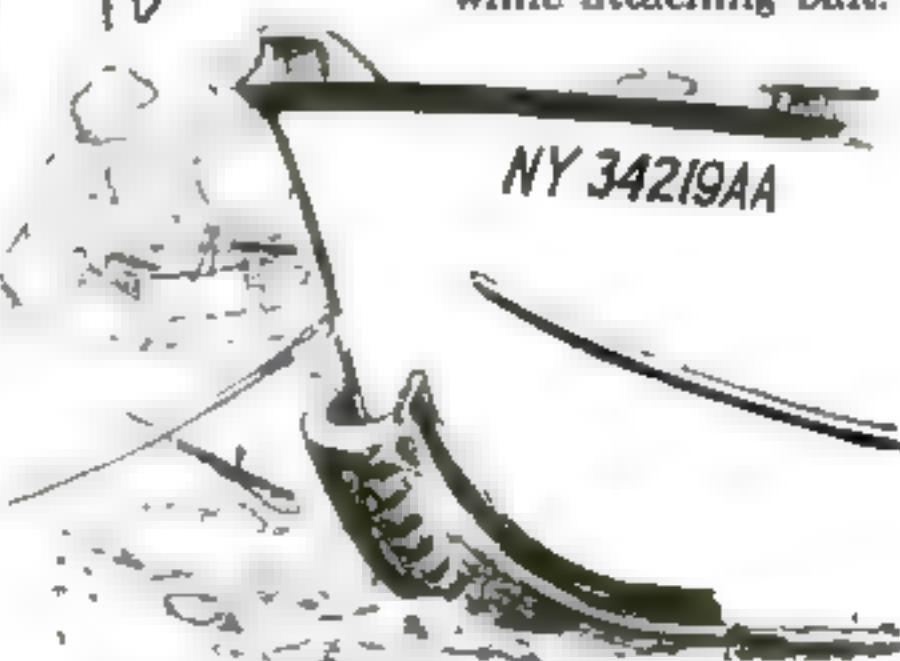
Lock the Oars to the Boat

HERE's a way to lock oars. Hinge the rowing seat and place a hasp at the free end. Mount a narrow board across the boat below the seat, and drill holes for the oarlock pins. Insert pins and oars, padlock the hasp, and your oars will be there when you return to the boat.



Rod Socket for Faster Baiting

FLATTEN the end of a piece of aluminum tubing and screw it, open end up, to the inside of the boat. Set the butt of your rod into it while attaching bait.

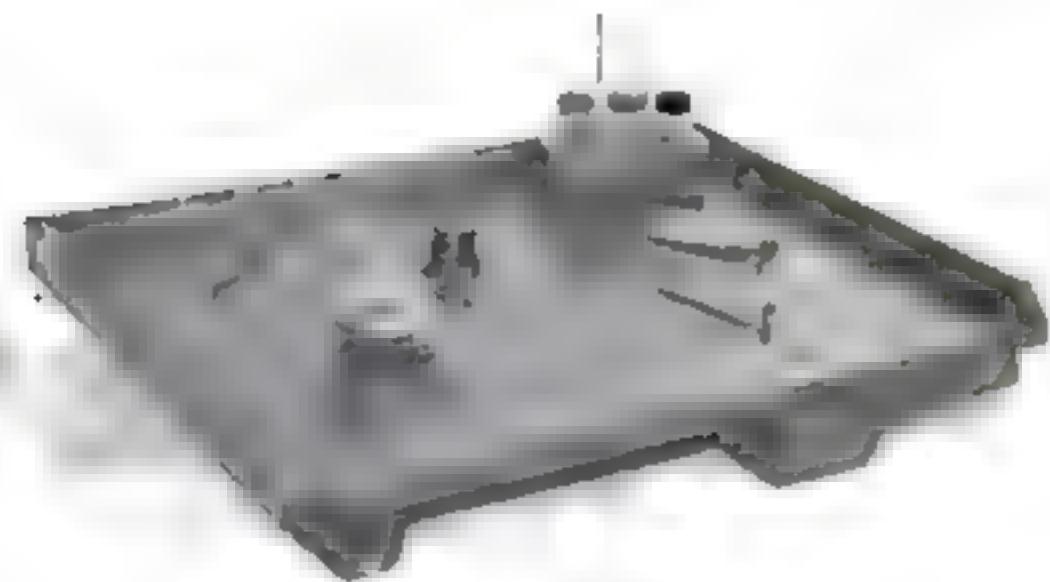
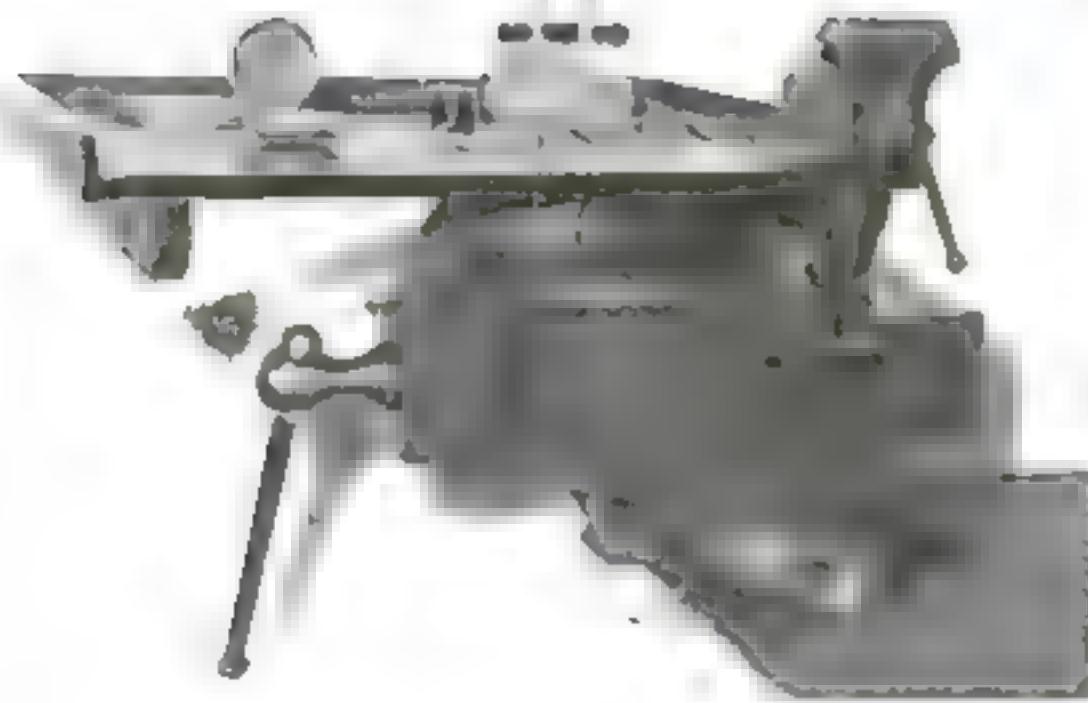


A Cushion for the Bow

ONE boater found his bow was being scratched and gouged by sand and gravel as waves rocked the boat while on the beach. He now carries a piece of auto casing and slips it on while beached.

Short Cuts and Tips

FROM THE READERS

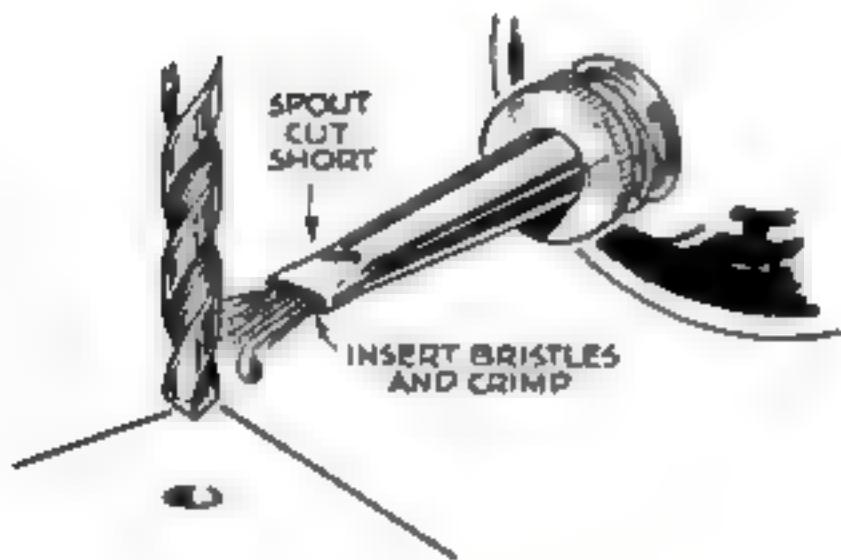


Auxiliary Bench Saves Stooping

THIS miniature work-bench eliminates the discomfort of crouching over the work surface when you're building tiny models or repairing delicate mechanisms. It raises the work 3" higher if placed on the bench or table top, and 9 1/2" higher if held in a machinist's vise.

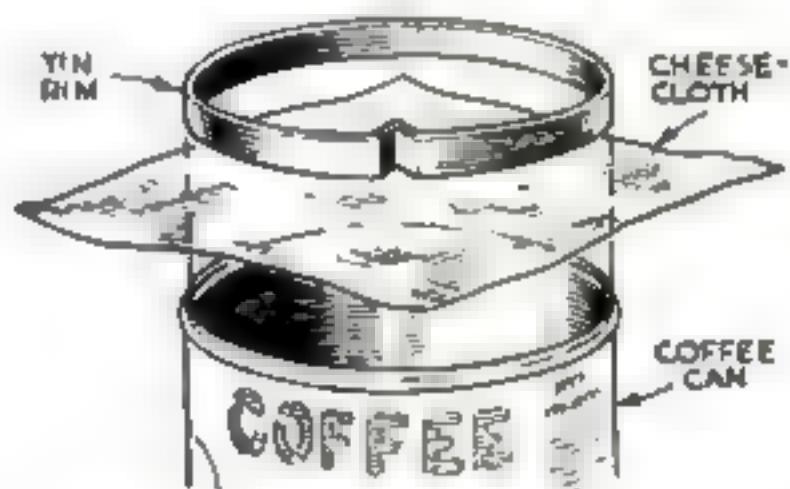
The top is a piece of 1/2" plywood, 14" by 18", with a 3/4" rail around three sides. Both cleats on the under-side are 2 1/2" high. One cleat is 3/4" thick and is fastened 2" in from the left side. The other cleat, 2" thick, is set 4 1/2" in from the right side to minimize overhang when in a vise.

A small vise clamps to the edge as shown.—J. P. Goodenough, Milwaukee.



Oilcan Brush Applies Coolant

HERE's a neat way to apply coolant on a long drilling or machining job. Crimp some bristles in the tip of an oilcan and brush them over the work or tool bit. The bristles clear away chips and flow on some coolant, but not enough to splash around and make a mess.—Daniel Bousha, Jackson, Mich.

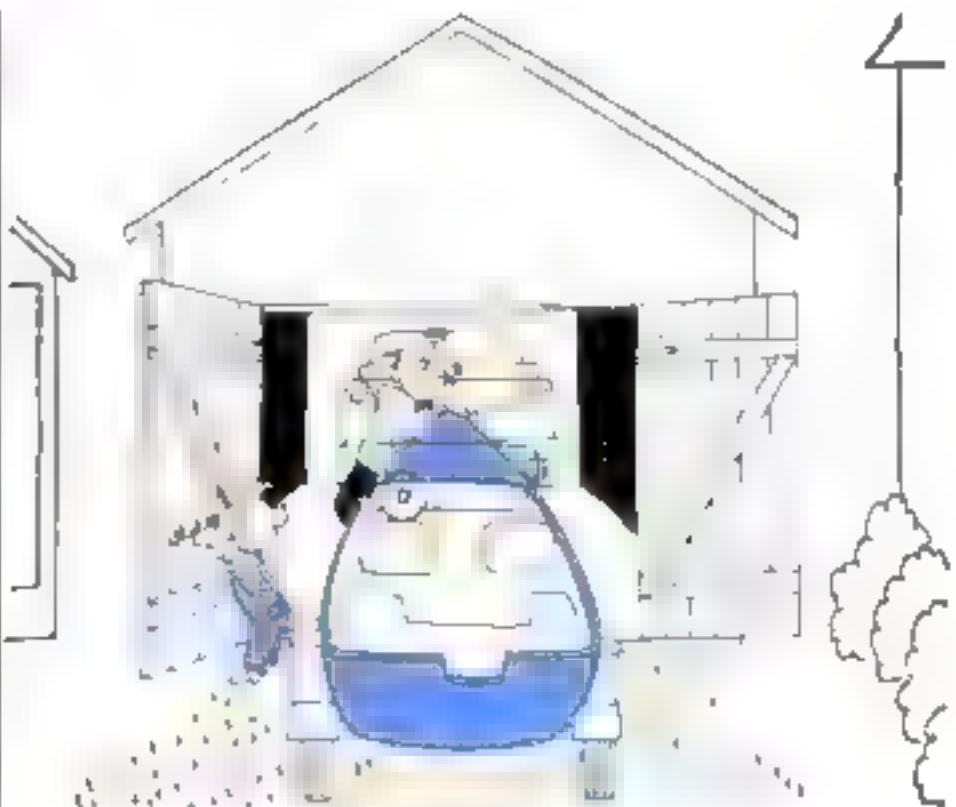
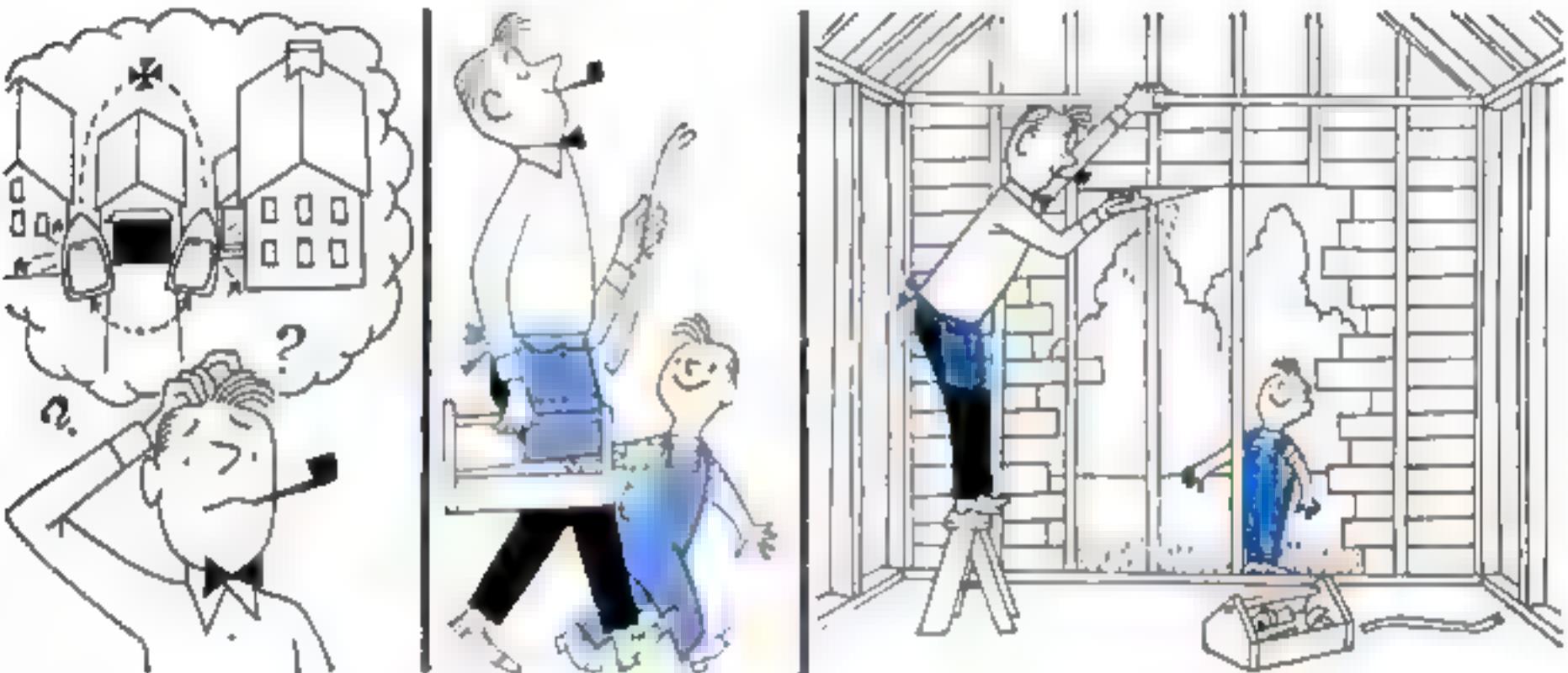
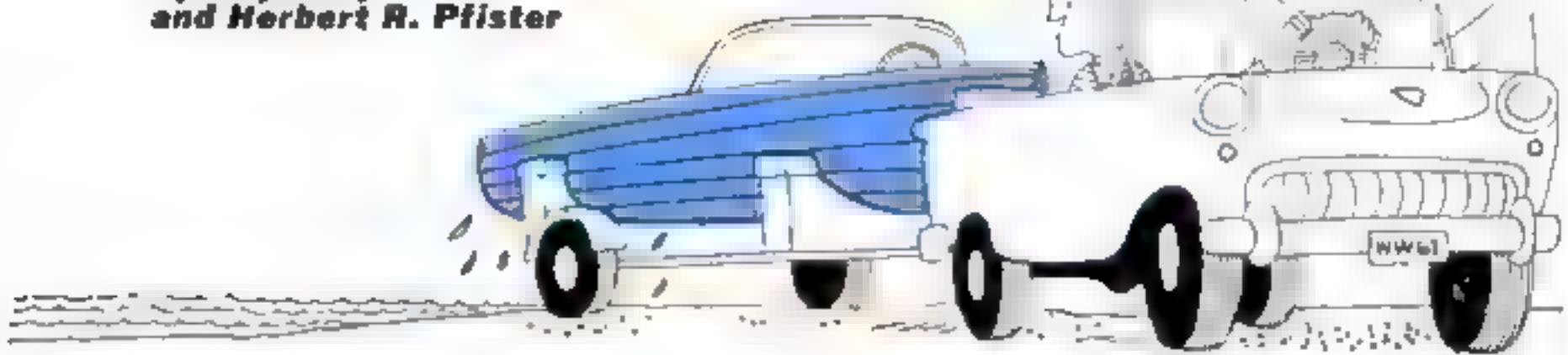


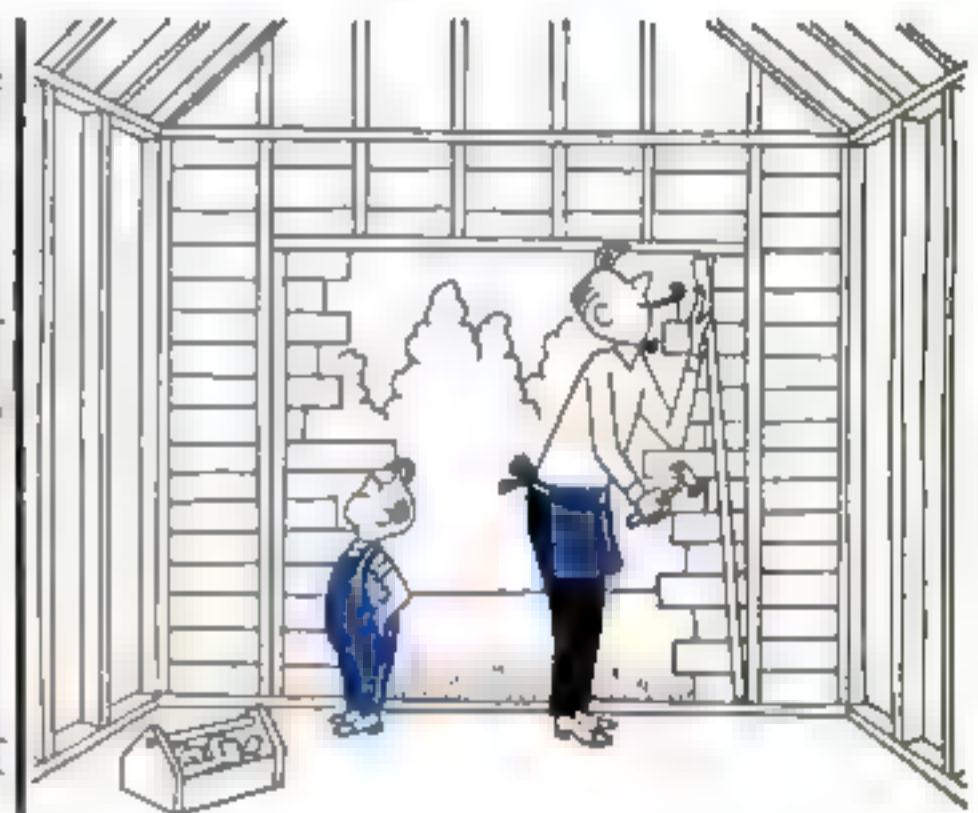
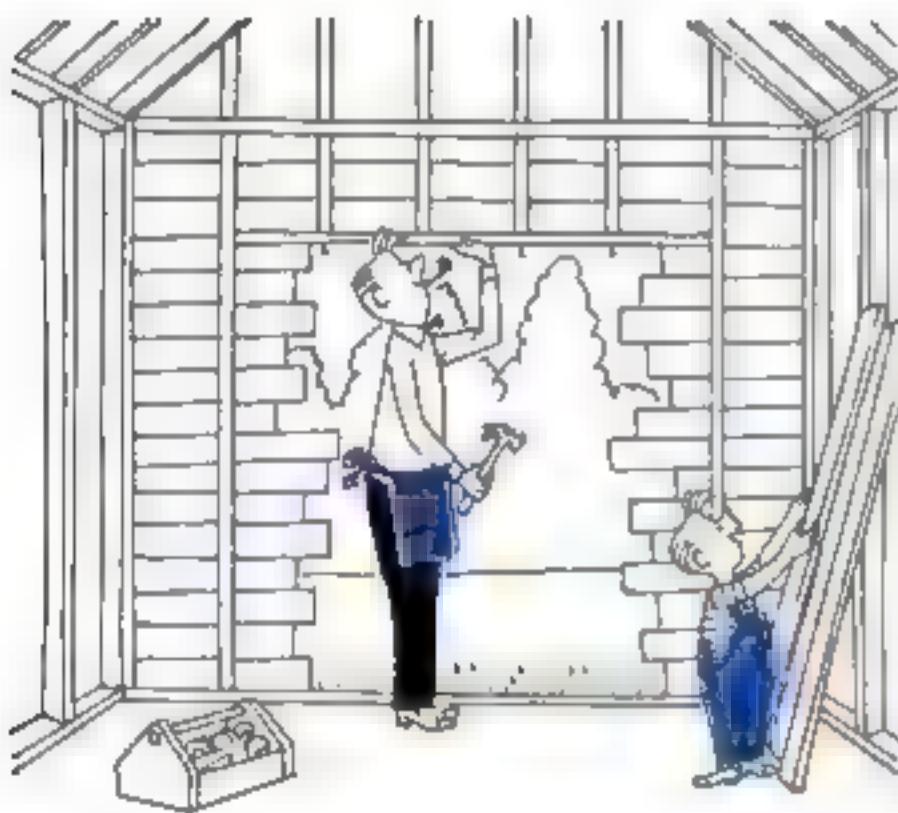
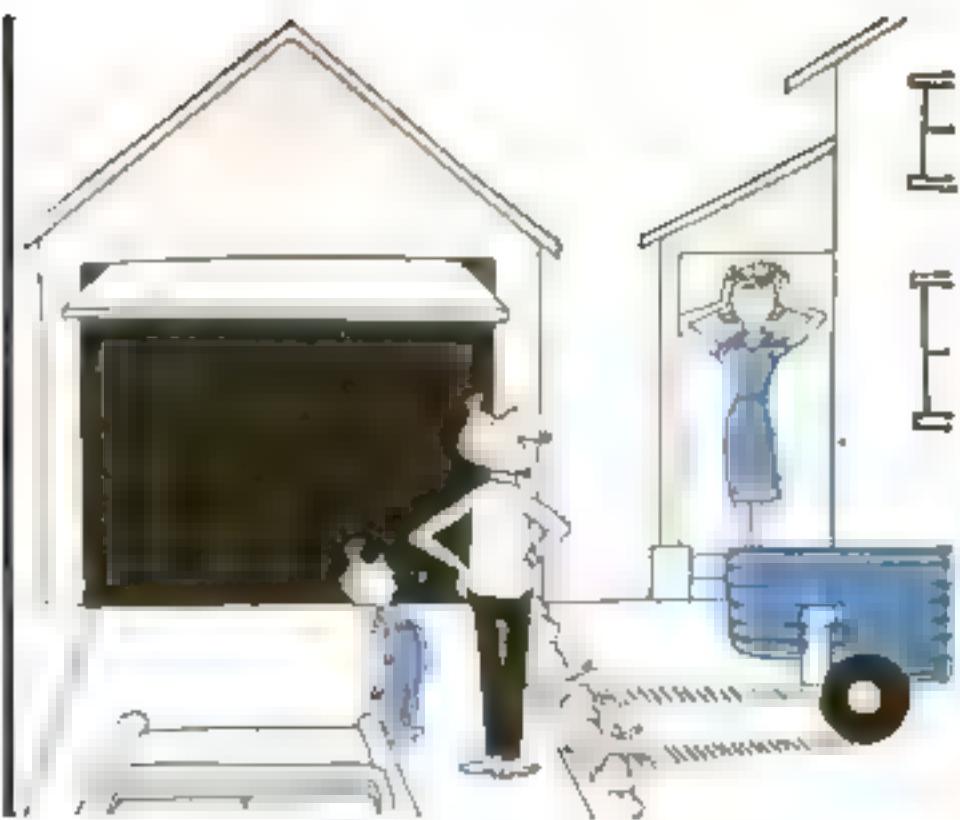
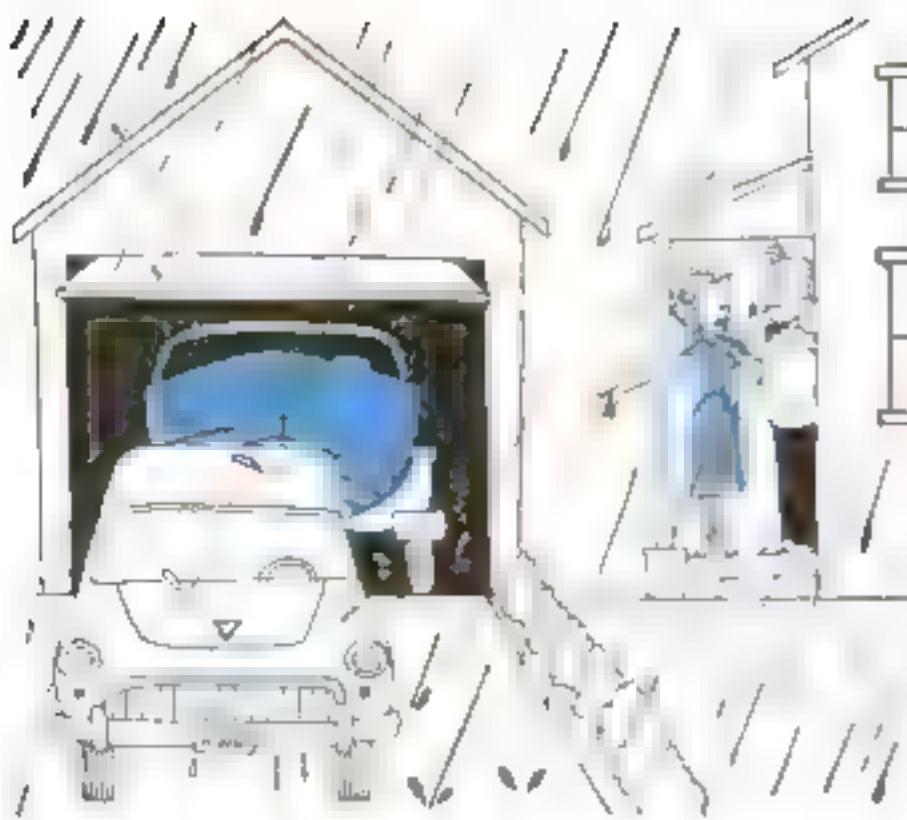
Can Rim Holds Straining Cloth

WHEN straining paint, I've found that the inner coffee-can rim can be used to stretch cheesecloth over the can in half the time it takes to tie the cloth in place with string. Pry off the rim, crimp it slightly, and press it, with the cheese-cloth, into the mouth of the can.—Joseph J. Maffei, San Francisco.

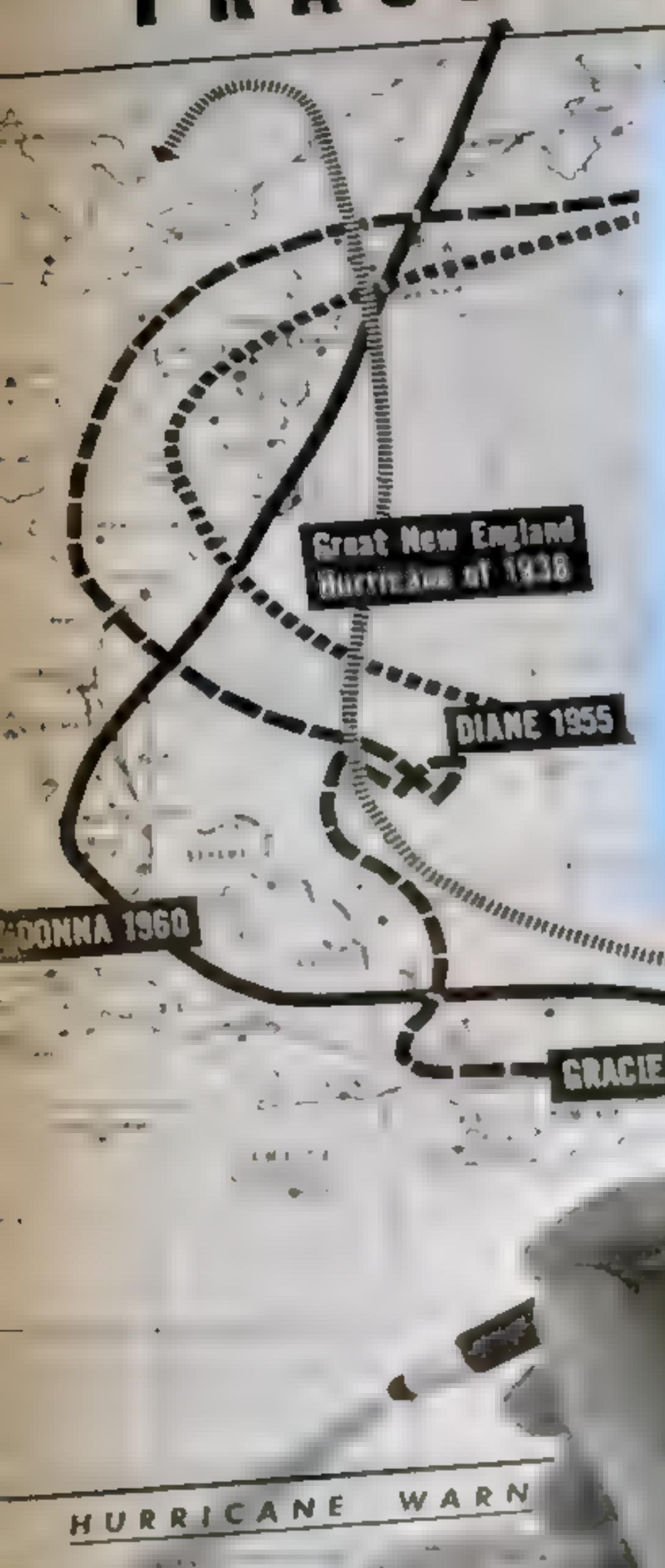
Wordless Workshop

By Roy Doty
and Herbert R. Pfister





TRACKING CHART



How You Can Track a Hurricane

REMEMBER the Great New England Hurricane of 1938, Diane in 1955, Donna last year? Their routes are mapped here on a Weather Bureau tracking chart. Using a blank copy of the map, you can track any hurricane that develops during the storm season beginning this month. Plot its location, speed, direction, and wind velocity data obtainable from regular TV and radio bulletins. Send a dime to Supt. of Documents, Gov't Printing Office Washington 25, D. C. for Hurricane Tracking Chart No. C30.22:H94

The slower the better for some jobs

Speed Reducer Runs Lathe in Slow Motion

TRICKY lathe operations—such as coil and spring winding, and turning or threading large-diameter parts from cast iron or stainless steel—require very slow spindle speeds. Often, the slowest speed on the machine isn't slow enough.

A simple jackshaft—just two pulleys and a steel rod, mounted on pillow-block bearings—can reduce the speed of the typical small lathe to 12 r.p.m. That's five seconds for each revolution.

Mount the jackshaft behind, and in line with, the lathe countershaft. Since this spot is usually occupied by the motor, the addition of the jackshaft involves remounting the motor. Depending on the setup of your lathe, you can move it farther back on the bench, place it on a shelf under the bench, or hang it on a pivoting mount fastened to the underside of the bench top. I cut a hole in the bench top for the V belt and mounted the motor beneath it.

Shim blocks under the pillow-block bearings raise the jackshaft so the original V belt and two-step pulley that were on the motor can be used to link the jackshaft with the lathe countershaft. I installed a $2\frac{1}{2}$ "-to- $4\frac{1}{2}$ " cone pulley plus a 7" pulley on the jackshaft. Since my motor mount permits the motor to slide as well as pivot, I mounted only two pulleys— $1\frac{1}{2}$ " and $2\frac{1}{2}$ "—on the motor. By shifting the motor, these can be aligned with any diameter pulley on the jackshaft. When the $2\frac{1}{2}$ " motor pulley is belted to the $2\frac{1}{2}$ " cone pulley, the normal range of machine speeds is restored.

The slowest speed available on my lathe before the changeover was 54 r.p.m. Using the $1\frac{1}{2}$ " motor pulley with the 7" jackshaft pulley cut this down to 12 r.p.m.—*Manly Banister, Portland, Ore.*



CUTTING COARSE THREADS in large-diameter work (such as $1\frac{1}{2}$ " pipe, above) is easier at reduced speed. Here, the $1\frac{1}{2}$ " motor pulley is used with a $4\frac{1}{2}$ " jackshaft pulley to run a lathe at 30 r.p.m. In rear view (below), setup is for slowest speed—about 12 r.p.m.





Moneysaving jobs you can do with—

The Man's Sewing Tool

By Herbert R. Pfister

UNTIL the stitches in my car's convertible top began to pop at the seams, I had never given sewing awls more than a glance—though I'd passed them many times in hardware stores.

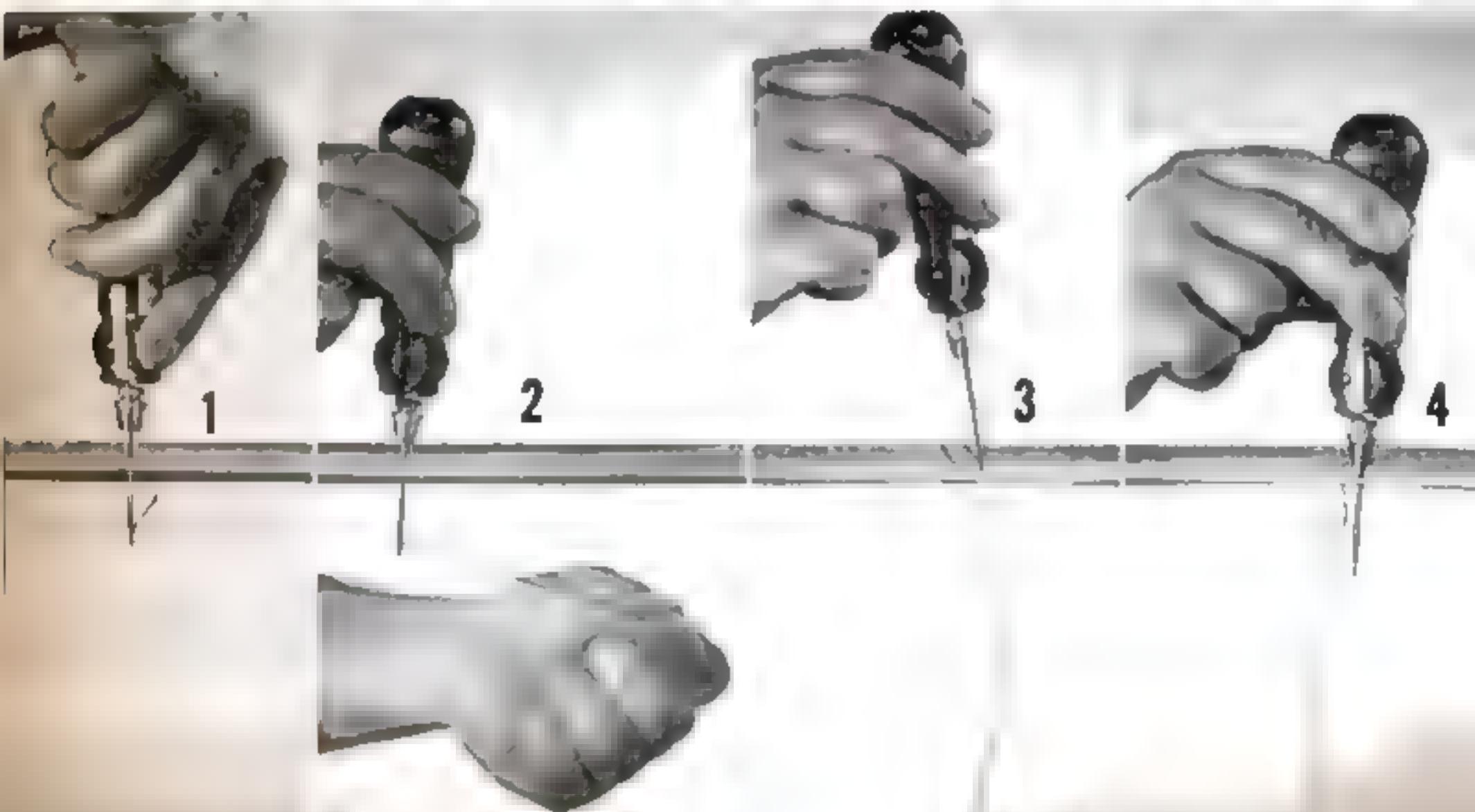
Hoping to save the car top, I bought

an awl and received a surprise; it's a man's sewing tool that will put neat, strong stitches in canvas or leather. It is most impressive when used to sew something that has come apart; you simply follow the holes left by the original stitches, and the finished repair looks factory sewn. The tool does a job that surpasses the overlapping, and often misaligned, sutur-

How to make a lock stitch with the sewing awl

PUSH THE AWL THROUGH THE MATERIAL, holding a finger on the reel as shown below in (1) so that the short end of the thread won't slip through the eye. Release the reel and pull the

thread through the groove in the needle until its length is about twice the distance to be sewn (2). Pull out the awl (3) and move ahead a distance equal to the width of stitch





CONVERTIBLE TOP can be saved if it pops at the seams; today's fabrics often outlast the stitching. Work can be speeded if you have someone inside the car to pass the thread through the loop and pull it tight after each stitch.

ing for which your shoemaker charges you 50 cents or a dollar.

The stitch is identical to that made on a bobbin-type sewing machine—a thread on the face side locking with a thread on the underside.

The sewing awl was first manufactured in 1910. There were many more horses then, and it filled a need for folks who

desired. Push the awl through the material with reel released (4) to begin the second stitch, and immediately pull it part way out (5). This forms a loop on the side of the needle opposite the groove. Insert the lower thread in the loop (6) and pull it through (7). Hold the reel

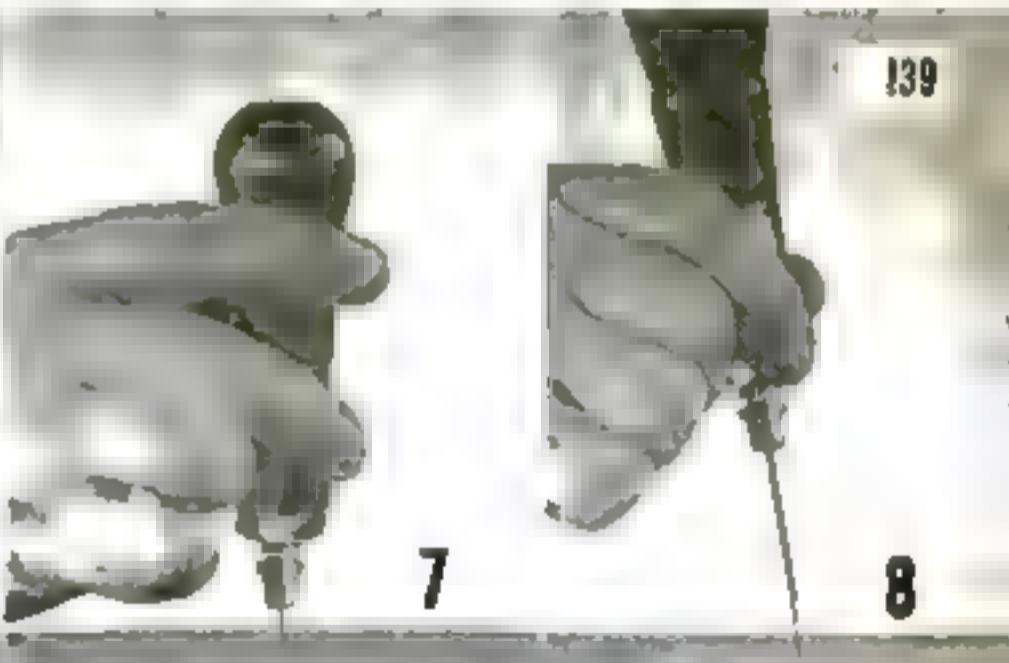
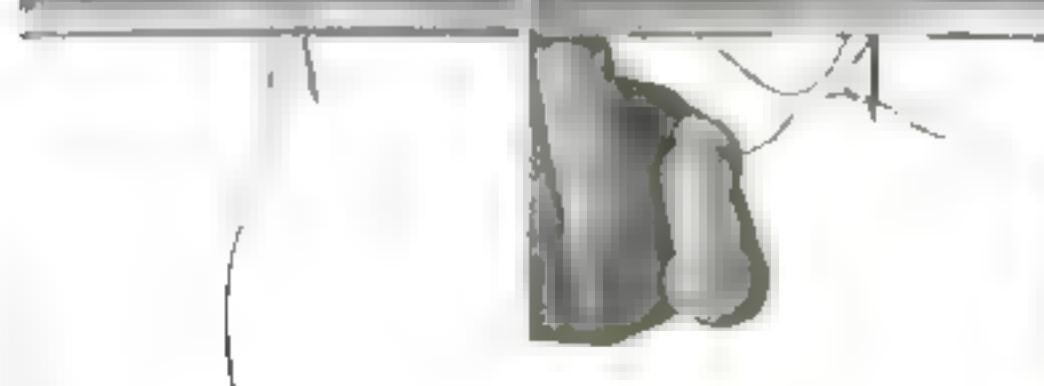


GOOD LEATHER seldom wears out; it comes apart at the seams. New stitching can restore luggage and camera cases to like-new condition. Soften the leather in water before you start sewing it, so the thread can be pulled down snug.

liked to repair their own saddles and harnesses. Stockmen also used it to sew cuts in the hides of cattle that had wandered into barbed-wire fences.

Either of the awls illustrated sells for \$1.98 at hardware and marine-supply dealers, or by mail order. Any thread can be used, but most dealers stock waxed cotton thread for leather work.

while you withdraw the awl and pull it and the thread in opposite directions (8) to tighten the stitch. All stitches after the first one are made the same way, releasing the reel each time you push the awl through the material. After the last stitch, cut the thread and tie it securely.

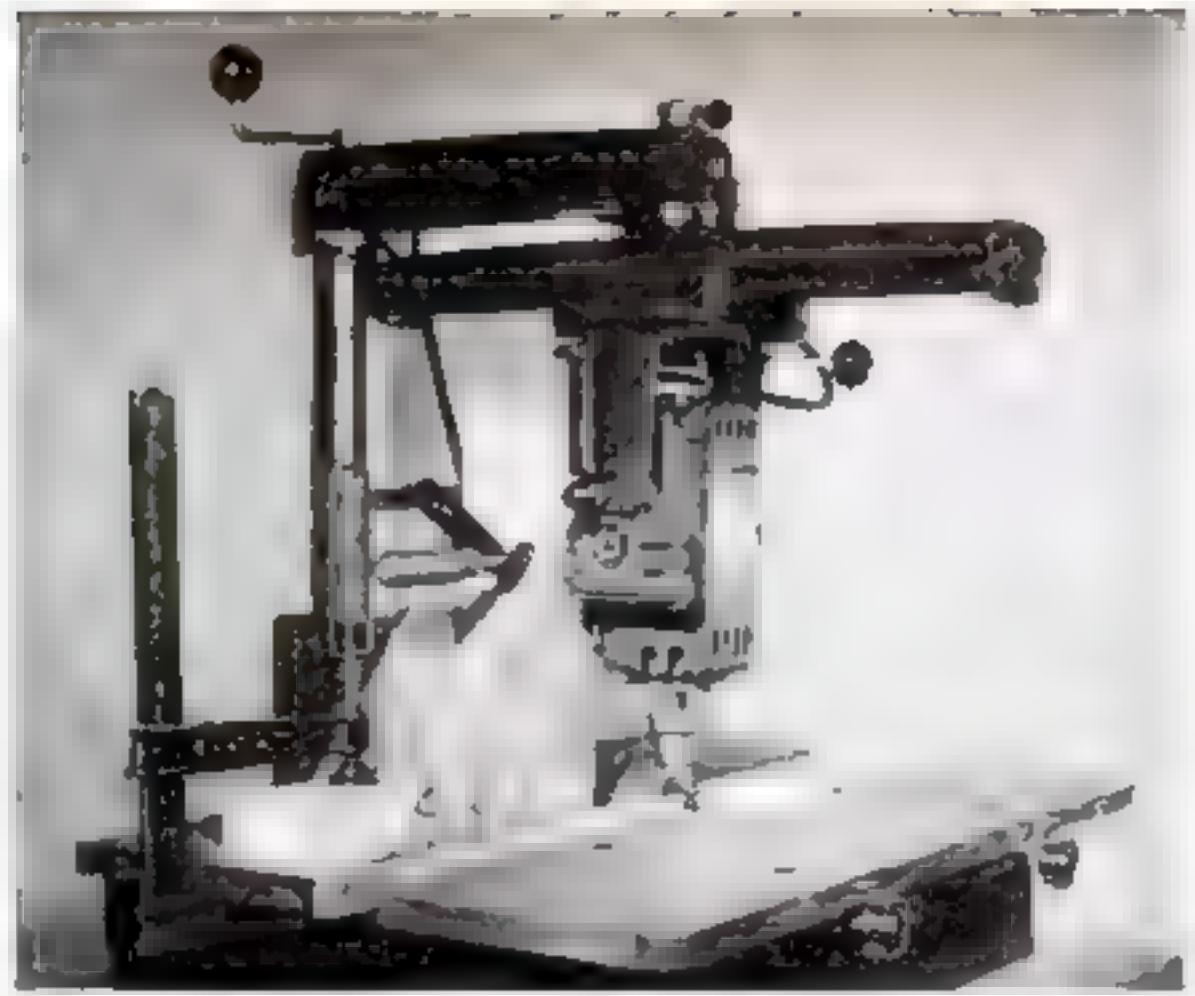


Short Cuts and Tips

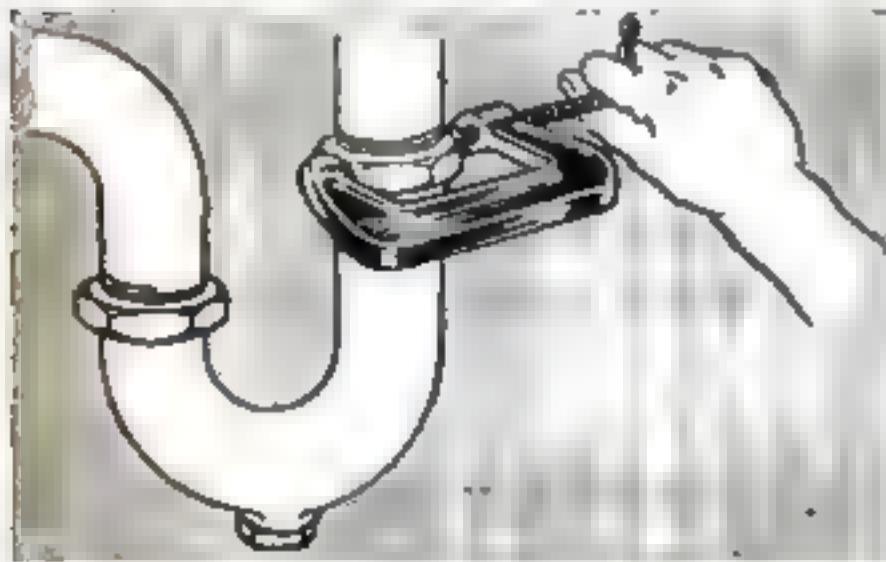
FROM PS READERS

Shaping Brace for a Radial Saw

A RADIAL saw can be set up as an efficient shaper, but in making a heavy cut in hardwood the cutter may chatter, resulting in a rough cut. To reduce this, make a bracket of right triangles and two-by-fours. After adjusting depth of cut, clamp one side to the table and the other to the motor.—*Ben Quan, Ottawa, Ont.*



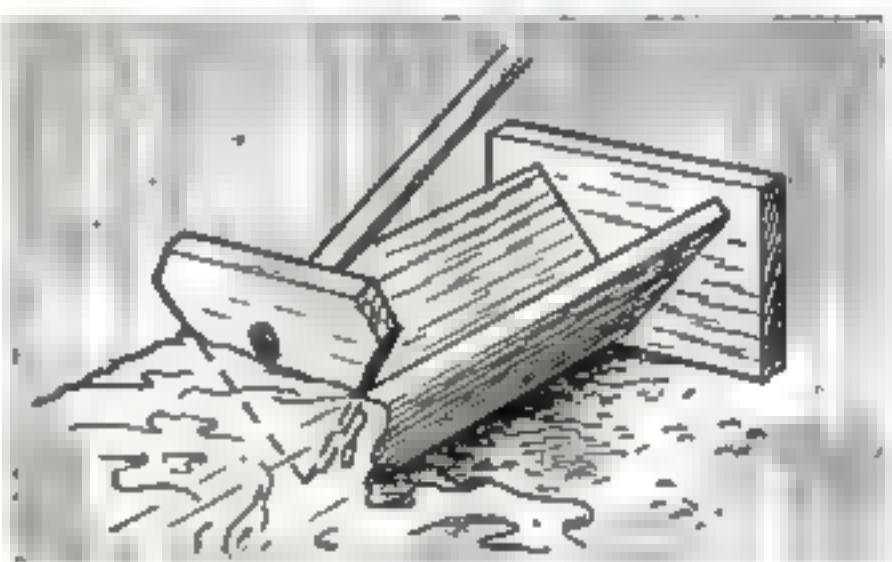
►►► STEEL table-saw blades dull rapidly when they're used to cut tempered hardboard. I get smooth cuts without chatter or twist by substituting an abrasive blade intended for brick cutting.—*Elmer E. H. Jorgensen, Springfield, Ill.*



C Clamp Turns Sink-Trap Nut

THE only available wrench large enough to grip the nut on my sink trap was one with toothed jaws that would mar the chrome. So I tightened a small C clamp on opposite flats to turn the nut.—*T. G. Thompson Jr., Anacortes, Wash.*

►►► WHEN pouring liquid into bottles, you won't have to steady the funnel if you seat it in a bedspring slipped over the bottleneck. This leaves both hands free to hold the container you're emptying.—*Steven R. Scadding, Toronto, Ont.*



Push-Stick Empties Hog Trough

DON'T strain your back lifting one end of an outdoor hog trough to tip out rain water or slush. Cut a scrap block to conform to the angle of the trough sides and insert a long handle. One push clears the trough.—*G. E. Hendrickson, Argyle, Wis.*



Make Sandpaper Last Longer

THE thin paper backing of fine sandpaper usually wears out before the grit. It won't if you reinforce it with a piece of cloth the same size. Dry-mounting tissue for photos makes a good bond, but slip paper between the cloth and hot iron, so the tissue doesn't gum up the iron.—*Ken Patterson, Moose Jaw, Sask.*

Popular Science

Raising the Roof Takes Big Prize

"We owned a three-bedroom home. We had three children, all boys. Then our fourth child arrived—a girl! We needed more room. With the help of two carpenters and a crane, we raised the roof and added three 10-by-11 bedrooms and space for a future bath. Pictures enclosed."

William W. Buckwalter of Phoenixville, Pa., made the above entry a year ago in the Popular Science Home Improvement Contest. It won him first prize, a Studebaker Lark. See pictures of his home below.

Hereafter, twice a year—in April and September—POPULAR SCIENCE will make a special award of \$50 for what the editors consider to be the best home improvement idea they have seen in the previous six months. Other ideas considered worth publishing in "Home Improvement Ideas" will be paid for at regular rates. Send entries to Home Improvement Editor, Popular Science, 355 Lexington Ave., New York 17, N. Y.

Before

... after ...

... and in between

Home Improvement Ideas

FALL 1961

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"Home Improvement Ideas," published as a supplement to a regular issue of POPULAR SCIENCE, is devoted exclusively to the physical betterment of the average man's greatest investment—his home.

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2. Cut off the WOODHILL Name and Address from the corresponding DURO PLASTIC fix-it package and mail with your entry to: DURO-PLASTIC CONTEST JUDGES, 3110 Prospect Avenue, Cleveland 15, Ohio.

3. Entries will be judged on the basis of originality, uniqueness and cleverness of thought. Judges decisions will be final. No entries returned. All become the property of The Woodhill Chemical Corporation.

4. All entries must be postmarked no later than midnight, Thursday, November 30, 1961.

5. Any resident of the continental United States and Canada may compete except employee of The Woodhill Chemical Corporation, its representatives, its advertising agency, the Judges and the promoters. Contest subject to all Federal and State regulations.

6. Winners will be notified by mail approximately four weeks after close of contest. List of winners available to those requesting same who enclose a stamped self-addressed envelope.

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Home Improvement Ideas

A Shell Home: Your Biggest Home Improvement Bargain

YOUR biggest buy in home improvement today is a shell house. A builder puts up the outside for you—the foundation, floors, walls, and roof—then you take over and finish the interior yourself.

The result: You get a home at a fraction of the cost of a conventional custom-built job. Full-size two- and three-bedroom shell houses are now selling for \$2,000 to \$5,000.

The shell idea has been around for years, but there are three big reasons for its recent whirlwind rise in popularity.

• Shell homes are now mass-produced by the thousands in the same way that early devel-

CONTINUED

FOR ABOUT \$66 A MONTH, you can own a 25-by-36' three-bedroom shell like this Crampton model in Tampa, Fla.



THIS THREE-BEDROOM SHELL comes complete with materials to finish it from the Robert R. Layton Co. in Delaware.



NO MONEY DOWN, seven years to pay, brings this three-bedroom Jim Walter shell to a \$3,595 time payment price.

YOU GET TWO BEDROOMS, porch, and car port for less than \$3,000 in this Institute For Essential Housing model.



What is a shell home?



FRAME IS PUT UP by professional carpenters, often using prefabricated parts to speed the job.



FINISHED SHELL is complete on the outside, including doors, windows, trim, even paint.



WHAT YOU GET looks like this on the inside. Beams are bare, ready for you to take over.

opment builders took over whole neighborhoods. The difference is that you can have a shell built on your own lot, anywhere you want it, and in any of a wide choice of sizes and styles.

- You can now finance up to the full cost of a shell home, no money down, and still do the finishing work yourself. In the past, shell homes were not eligible for regular mortgage loans.

- Unlike other forms of do-it-yourself houses, a shell home comes to you completely finished on the outside, including siding, shingles, windows, even two coats of paint. The heavy structural work has all been done for you—you can't even tell from the outside that it isn't finished.

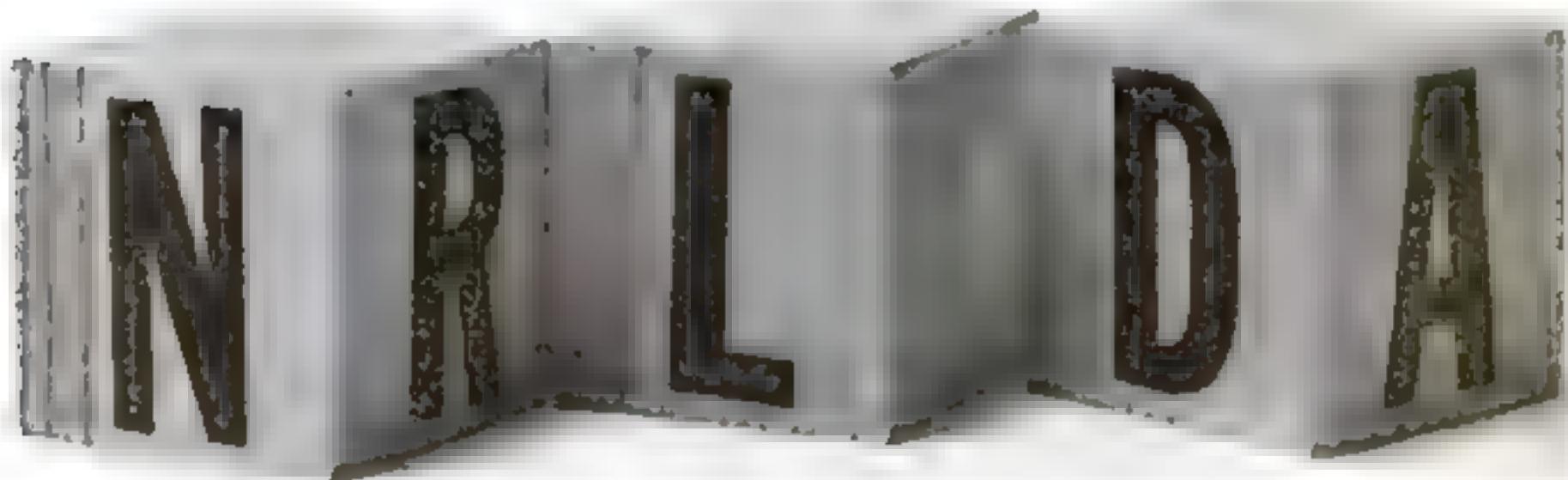
Inside, a shell home looks much like an unfinished attic or basement; in fact, the finishing jobs are similar. In most cases, the floors are down, but wall studs and ceiling joists are exposed. You add insulation, paneling, doors, trim, and the heating, plumbing, and wiring.

The shell is a natural for custom-tailoring your own home improvements because you aren't tied down to a fixed plan. Built-in furniture, cabinets, storage walls, and special shop and hobby areas are easily designed to suit your own needs. Most builders will allow you to choose any room plan you want.

Modern materials make it easier. The many prefinished materials and packaged kits now on the market are another big reason for the boom in shell homes. They make it practical to tackle finishing jobs yourself that would have been difficult or impossible a few years ago. By the same token, many of the tricks used in finishing a shell can be borrowed for improving an existing home.

Peter Leschuck, who recently finished a two-bedroom shell on Long Island, N. Y., says: "I found that prefinished plasterboard is only a few cents more a square foot than the regular stuff. It looks terrific and saves patching joints and painting. I also used prefinished ceiling tiles, which go up fast and require no extra work."

Leschuck spent \$3,500 for his original shell and another \$2,500 to complete it for a total of \$6,000. This, he figures, is equivalent to a \$10,000 custom-built home. "I got a good wiring book and did all the electrical work myself," he adds. "Even put in my own 220-volt line



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for an electric range." Another owner used prefinished hardboard on his walls and ceilings and says: "Those big sheets really made the job easy."

Many owners are also discovering the convenience of packaged kitchens, bathrooms, plumbing kits, and simple fit-in-a-closet furnace units that are now available. Some building-supply houses and mail-order outfits like Sears, Roebuck will sell you a complete heating system of any type for \$275 to \$700. You get all the parts—including pipes and ducts cut to exact length—plus instructions for putting them together yourself.

How swank can a shell get?



SPACIOUS SPLIT-LEVEL DESIGN in Cold Spring, N. Y., is one of many luxury models available at low cost. It includes three bedrooms, garage, even a playroom. Empire Swift Homes sells it for \$5,375 as pre-cut package or \$7,075 as fully erected shell on your lot.



PUTTING WALLS TO WORK is easy in a shell. Owners of this Paddock Lake, Wis., home hid the laundry area behind two ceiling-high doors that close (left) for entertaining. Doors are wood-framed hardboard with shallow cabinets on the front and X braces in back for strength.

Everything you need for a bathroom can be had for \$150 to \$300. Flexible plastic pipe is now used extensively for cold-water lines and may soon be available for hot lines. Pre-wired electrical fixtures and surface raceway wiring also speed the work.

How about building codes? These are usually no problem on the shell itself since manufacturers make sure that their houses meet local code requirements before moving into an area. On the finishing work, you will be expected to meet the same codes set up for professional plumbers and electricians. As long as you follow the requirements carefully, you'll have no trouble getting your work inspected and approved.

There are ways around this, too. Some builders will sell you all the finishing materials along with the shell, including the basic code-approved wiring, plumbing, and heating supplies. Many owners have this basic work roughed in by a professional, then do the final hook-up of fixtures themselves. Another way to get skilled help is to join forces with other nearby shell finishers—you help them and they help you, combining each other's abilities. Or you can hire out all the plumbing and electrical work and still save a considerable amount by doing the other finishing jobs yourself.

You should know, in any case, just what the local requirements are. Some shells are designed with 24" spacing of studs and joists. Where this isn't per-

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mitted, there will be an extra charge for setting the beams on 16" centers. Some codes also require that a home be completely finished before you move in—a hardship if you're planning on a live-while-you-work arrangement.

How much do you really save? Some shell builders advertise savings of up to 50 percent over a custom-built house of comparable size. This is probably optimistic. According to actual experiences of shell owners, savings range from about 25 to 40 percent.

Some companies are not strictly shell manufacturers, but offer houses in various stages of completion—a good tip-off on how prices compare. The Institute For Essential Housing in Princeton, N.J., for instance, will sell you a three-bedroom house for \$3,188 in shell form, \$4,380 for the shell plus materials to finish it, and the same home completely finished for \$5,780. By buying the shell plus the materials and doing your own work, you can save \$1,400—or about 25 percent.

Arthur Tickner in Tampa, Fla., bought a two-bedroom shell for \$4,200 and added another \$4,300 to finish it. He didn't need a full heating plant, but otherwise this included everything, plus several extras—an added utility room, double-size car port, screened porch, and larger windows. He did most of his own work except for the wiring and plumbing. Time: about three months, working evenings and weekends with a helper.

As a rule of thumb, you can figure that finishing costs will run from about half up to as much as the shell itself. Many shells, especially those in the South, come with an inexpensive pier-type foundation; if you want a full foundation, you'll pay several hundred dollars more. Basements are also extra, as are sewer and water hookup charges, and a septic tank if you need one.

How you can buy a shell. Most shell builders make it easy for you: They'll either lend you the money themselves or arrange a loan for you. The only requirement is that you own your own lot.

Mortgages run five to seven years, usually at six-percent interest. Typical monthly payments range from \$32.87 for a \$2,250 shell up to \$65.74 for a \$4,495 model. Builders who also sell finishing materials will include the entire cost in

one mortgage so you have nothing else to buy.

Is a shell a risk? This is a point of some controversy. The Institute For Essential Housing will sell you a shell if you insist, but frankly doesn't recommend it. Too many shells go uncompleted, they maintain, because owners suddenly find themselves short of cash to buy the finishing materials.

A safer bet, says the Institute, is a shell-plus-materials deal where there's nothing extra to pay for. Monthly payments may actually be lower, they point out, even though the total cost is higher. The reason: The shell-plus-materials plan is financed over a much longer period—up to 12 years—so the monthly payments are spread thinner.

Of the Institute's own sales, only one percent of owners bought the bare shell. The majority elected either the shell-plus-materials package or the same home in semi-finished stage. "So we're definitely not in the shell-only business," says the Institute.

Those who sell only shells argue back that the greatly increased value of a finished home is strong enough inducement to force owners to get the work done. Records show, they claim, that most shell homes are completed within two to four months. They also cite the fact that only about one percent of shell homes are lost through nonpayment of their mortgages. This figure does not include cases, however, where mortgage payments are kept up but the house still goes unfinished for years. A bank would never permit this; a shell builder can afford not to care.

Responsible builders, like the Institute, also warn against some operators who "load up" an owner with a high mortgage just to sell him a house. "This makes it look easy," they point out—"sometimes too easy."

In any case, the finish-it-yourself home is fast becoming the answer for those who want to trade their own time and muscle for a substantial saving in cash. An estimated 60,000 owner-completed shells went up last year alone, with more than 100,000 predicted for this year. One happy Florida owner built a \$2,780 shell on a \$1,000 lot, adding only about \$600 worth of finishing materials. He's been offered \$8,000 for it. ■ ■

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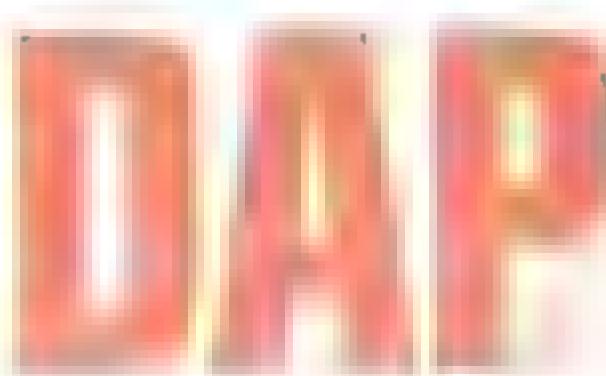
Use DAP KWIK-SEAL to seal cracks in joints around tubs, sinks and lavatories. For pointing or resetting tiles, too. Squeeze Kwik Seal from the tube—use finger to smooth and finish—works quickly, easily. Waterproof—dries white, stays "rubbery."



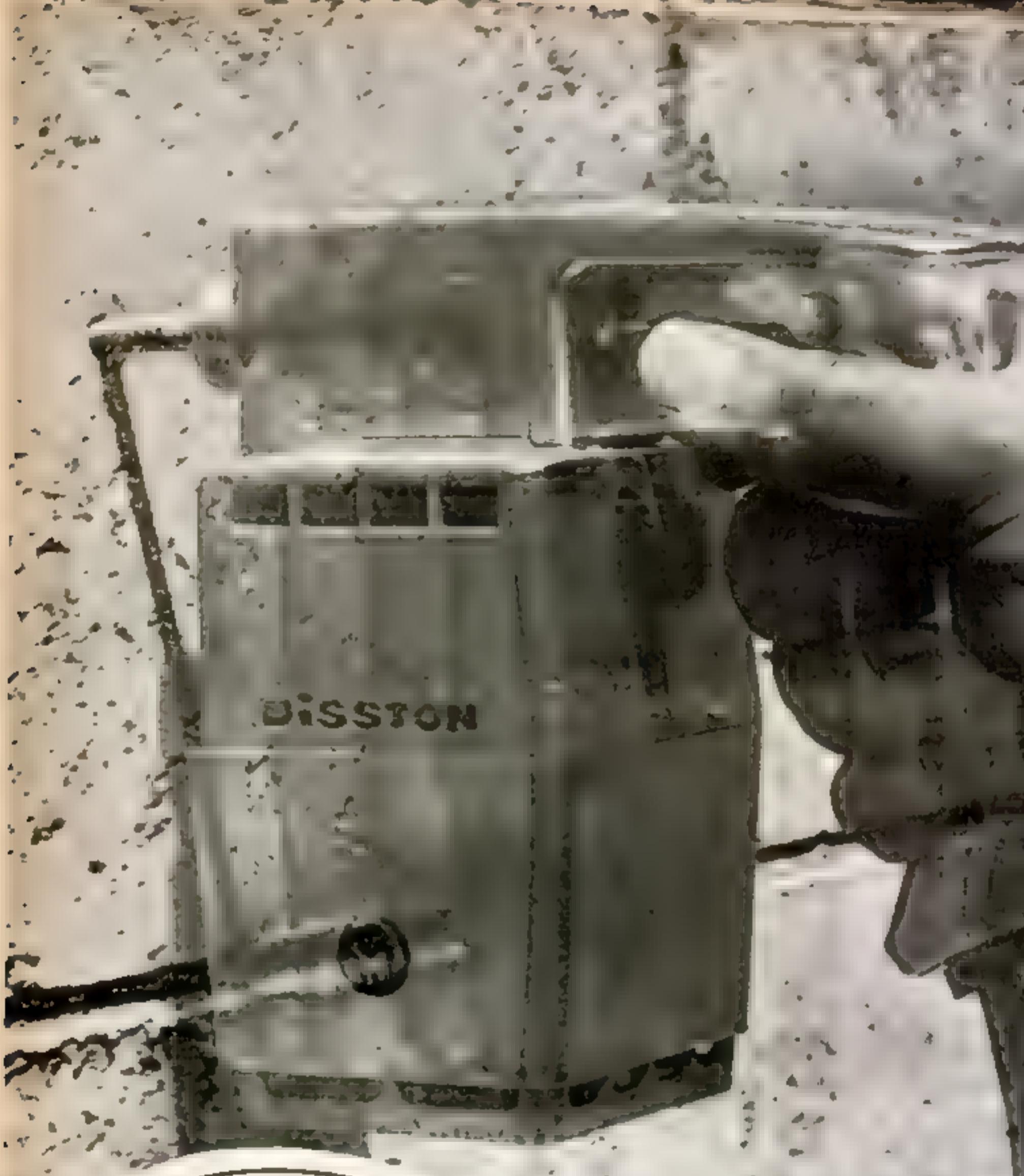
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See the Disston Dirk $\frac{1}{4}$ " drill now on display in your local hardware store for \$30.00 (only a nickel more than the next best drill). Once you try it, you'll want to buy it. The Dirk, made in Danville, Virginia, is another fine product from Disston, master toolmaker since 1840.



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A wonderful way to use that extra space a compact car opens up

THE new compact cars—short, narrow, and low—give you extra space in your garage. Nudge one of them into a corner of even a one-car garage, and you'll have enough room left over for a king-size workbench and a huge cabinet; plenty of wall space for hand tools; and enough floor area for some power tools.

Building such a shop is a simple job, especially since the bench and cabinet also double as the partition between the

shop and garage. The idea for it popped up when a POPULAR SCIENCE writer traded his road-scarred, standard-size automobile for a compact.

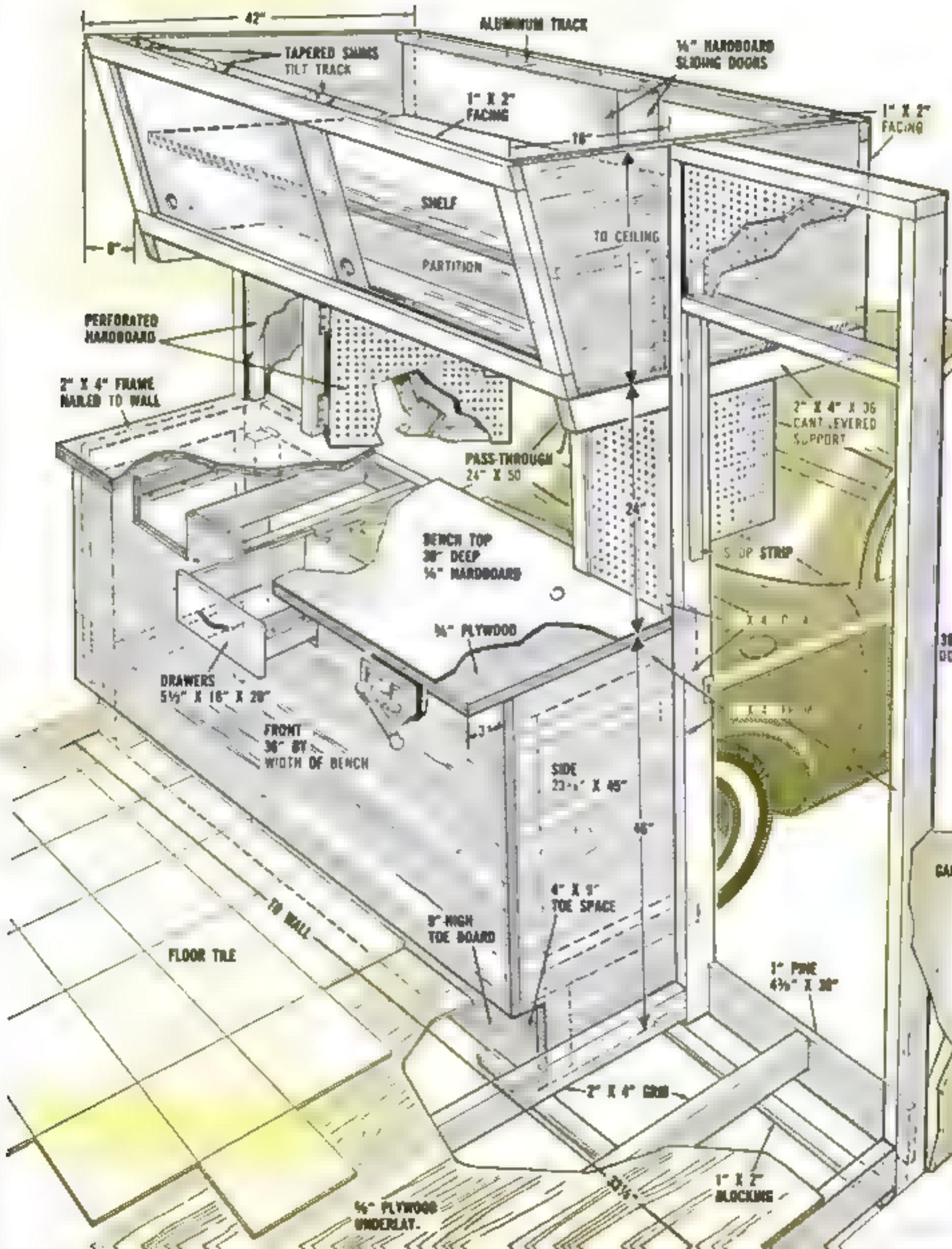
The old car—some 17' long and 80"

CONTINUED



Compact Car

Home Improvement Ideas



No tricky joints; just plywood over a frame of two-by-fours



TWO-BY-FOURS frame entrance doorway and bench. Where possible, frame is nailed to studs in garage wall to anchor unit in place. Top of door frame is nailed to ceiling joists.



BUILD AROUND THE HOOD when laying out the framing. With the car in the garage, you'll be certain it will fit when the job is done. Note clearance between hood and cross member.

NOSE OF CAR snuggles into this space under the bench. Two-by-fours in lower foreground are fastened to the floor with cut nails to stop the car just before it bumps the bench.



wide—had only a couple of feet behind and in front of it when parked in the garage. That's about par for the course; a single-car garage averages 21' in length, and is about 11' wide. A compact car—a mere 15' long and 67" wide—leaves 6' of parking space unused in front of it, and more than 4' of wall-to-wall space at its sides.

Like stalling a horse. The lowness of the hood—it's only 35½" off the floor—made the shop idea still more practical. Between the hood and the garage ceiling there was a big 5' of usable space—making it possible for the workbench and cabinet to be built *over the hood*. Since the 2½' depth of the bench is actually in the garage area, the effective length of the shop adds up to 8½' (6' of floor space plus the 2½' bench top). In a garage 11' wide, you'd get more than 93 square feet of shop space.

That was the idea. It worked out fine. The plans show how you, too, can squeeze a shop into the extra footage your compact—or small foreign sedan, for that matter—adds to your garage.

After erecting the framework, start building the cabinet. It's easier to work on it without the workbench in the way. The two ends, partition, shelf, and bottom of the cabinet are cut from ½" plywood and assembled on the cantilevered frame members fastened to the wall and door frame. The partition, fastened between the shelf and bottom of the cabinet, creates an I-beam effect that keeps the cabinet from sagging in the center.

Do-it-yourself aluminum track guides the ¼"-hardboard sliding doors on both sides of the cabinet. Note that the track on the shop side must be installed on beveled shim strips to match the slope of the cabinet face.

Fit the ¾"-plywood bench top in place, screw it to the frame, and cover it with ¼" tempered hardboard to provide a smooth, durable work surface.

Cover the front and right end of the bench with panels of ¾" plywood. Close in the toe space along the front with plywood strips. All joints are butted and fastened with 1½"-10 wood screws. Cut three openings in the top edge of the front panel: two for the drawers, and one to clear the guide rods of your woodworking vise.

CONTINUED

Remarkable new PPG LATEX House Paint guards against ugly blistering and peeling!



Left: Moisture escaping from inside the house causes some house paints used on wood siding to blister and peel.



Right: New PPG LATEX protects siding against such damage. It's trapped moisture out without harm to paint film.

Lasts years longer . . . goes on faster, smoother . . . can be applied even over damp surfaces . . . dries in just 30 minutes . . . brush or roller wash clean in soapy water!

• Thorough testing . . . in various climates . . . has proved sensational new Pittsburgh LATEX House Paint superior in many ways.

• Far easier to apply, it "wraps" your home in an amazingly tough, flexible film that prevents unsightly blistering and peeling years longer.

• Thanks to new miracle resins, white stays whiter, and colors stay brighter—on any type of construction!

• PPG LATEX goes on right over damp surfaces . . . dries dust- and bug-free in $\frac{1}{2}$ hour. Wash up with soapy water!

• For the best paint job ever, just use new PPG LATEX and follow directions.



• Saves time and work, because PPG LATEX goes on faster, smoother—without brush drag, or lap marks.



• No rain worries, no wasted work! Soon as the rain stops, you can start right in painting again!



• Dries bug-free and dust-free in $\frac{1}{2}$ hour. You can apply second coat without even moving your ladder!



• Easy cleanup! Just wash brush, roller or spray in soapy water—wipe up spatters with damp cloth.

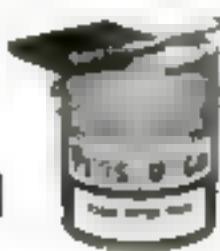


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Doorways extend the shop even farther into the garage



TOOL-LADEN DOORS open up a pass-through more than 4' wide at the rear of the bench. Doors swing out into garage, putting tools within reach when you're working on the car.

ENTRANCE DOORWAY permits long boards to extend out into the walkway beside the car while being cut to size. Extra-long lumber can be supported at outboard end with a sawhorse.



BIG JOBS can overhang bench at front and rear with pass-through doors open. With all this room inside the shop, take care not to build something so big that you can't get it out.

The drawer sides, front, and rear are $\frac{3}{4}$ " plywood framed around a $\frac{1}{4}$ "-hardboard bottom. The drawers are hung on metal slides fastened to the bench frame.

A pass-through for the coffee break. The doors at the rear of the bench are built up over two pieces of $\frac{3}{4}$ " plywood cut to fit the opening. Nail a one-by-one frame around the edges of the plywood on both sides, and fasten perforated hardboard over the frame. This provides space behind the perf-board to take the ends of the wire tool hangers.

The plywood floor is laid over two-by-fours, supported by one-by-two blocking fastened to the concrete with cut nails. Besides adding to your comfort



BIG PANELS SLIDE THROUGH the wide opening. By elevating the saw on blocks until it is flush with the bench top, you can use the bench as a support for cutting the panels.

in the winter, the combined thickness of the blocking, the two-by-fours, and the plywood will raise you an extra 5". Without this lift, the surface of the bench, 46" above the concrete floor, would be too high for comfortable working. Floor tiles, cemented over the plywood, make sweeping up easier. You can pass up the luxury of the floor, but then you'll have to lower the bench top to about 40". This means omitting the drawers, or making them very shallow to clear the car.

A 30" flush door is hung in the main doorway so that it swings outward into the garage. Locks can be installed on the door and pass-through to safeguard your tools.



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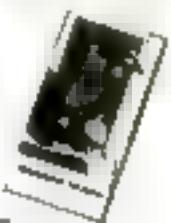
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You can add beauty to your home, indoors and out, by—

Using Prefab Iron Railings

WANT to dress up your porch or patio, the front steps, or even a living-room alcove, with iron railings? Good idea. Today's improved pre-fabs offer good looks, utility, lower costs, and easy installation.

How do you do it? Use pre-welded railing sections and special posts and fittings. You set the posts (surface mount them if you wish) and then bolt on the railing sections. To top it off, you can choose from a slew of prefab iron ornaments and columns.

Railings, plain and fancy. Prefab iron railings come in 4', 6', and 10' lengths. Basically, a section consists of U-shaped top and bottom channels (1" wide, $\frac{1}{2}$ " deep, $\frac{1}{8}$ " thick) with pickets welded on at 5" or 6" centers. The railing sections vary in height. Some are 27", some 29". They are all around 31"-32", however, when installed.

Some manufacturers offer just a basic, low-cost, lightweight railing with flat pickets— $\frac{1}{2}$ " wide, $\frac{1}{8}$ " thick—twisted and welded on 6" centers. Others make pre-fab railings with traditional $\frac{1}{2}$ "-square solid pickets, usually on 5" centers. One variation on the square picket design is the alternate-twist pattern—with every other picket twisted.

A unique virtue of prefab railings is adjustability. Each railing unit may be slanted to fit any slope or set of steps. It takes a little heave-ho, but not much. Railings of this type are available from several manufacturers and from mail-order houses such as Sears, Roebuck.

One maker offers nonadjustable railing for entrances. This ranges from 2' 8" to 4' 2" in length and has an end post

Here's how wrought iron dresses up a stairway



welded to the railing section. The hand-rail curves up at the back where it attaches to the wall. Another curve at the front makes a lamb's-tongue ornament.

One type of prefab railing distributed by a mail-order house (Ward's) is a real do-it-yourself item. You make up your own railing sections by bolting individual flat, twisted pickets on 6" centers to pre-drilled T-bar top and bottom rails 3' or 5' long. The railings are then bolted to posts.

These railings are not adjustable, but they don't have to be—you build them right in place and they conform to any angle from the beginning.

A useful accessory in the prefab-railing line is

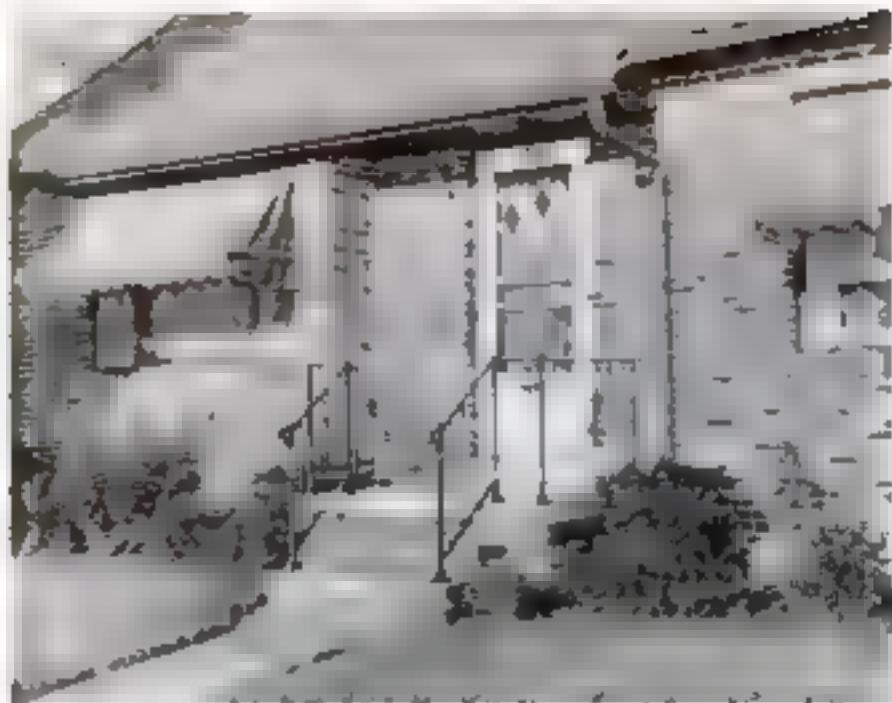
a kit for making a gate. It includes a hinge section, latch section, and latch plate. The hinge and latch sections are bolted to a railing section of desired length, and the entire unit is mounted on a railing post.

Posts to hold it all. Posts are heavy-gauge steel tubing 1" square and 35"-36" long. This permits them to be anchored in concrete. If they are surface-mounted, about 3" is cut off.

Posts in the higher-priced lines have molded, welded-on fittings for attaching the railings. Such posts are made in end, intermediate, and left- and right-corner types for both steps and porches. Posts in the lower-priced types

Home
Improvement Ideas

Use wrought iron at the entranceway



of railings are simply lengths of tubing.

Surface installation of posts is possible with base plates or flanges. One type of plate has a socket into which the post fits, held by setscrews. Another type has a stub that fits into the hollow end of the post. Usually the post is then welded to the base plate.

For bolting railing sections to posts that do not have welded-on fittings, the manufacturers furnish $1\frac{1}{2}$ " right-angle iron brackets. The posts are usually pre-drilled, but holes have to be drilled in the railing channels. The brackets are bent to adjust for railings on steps.

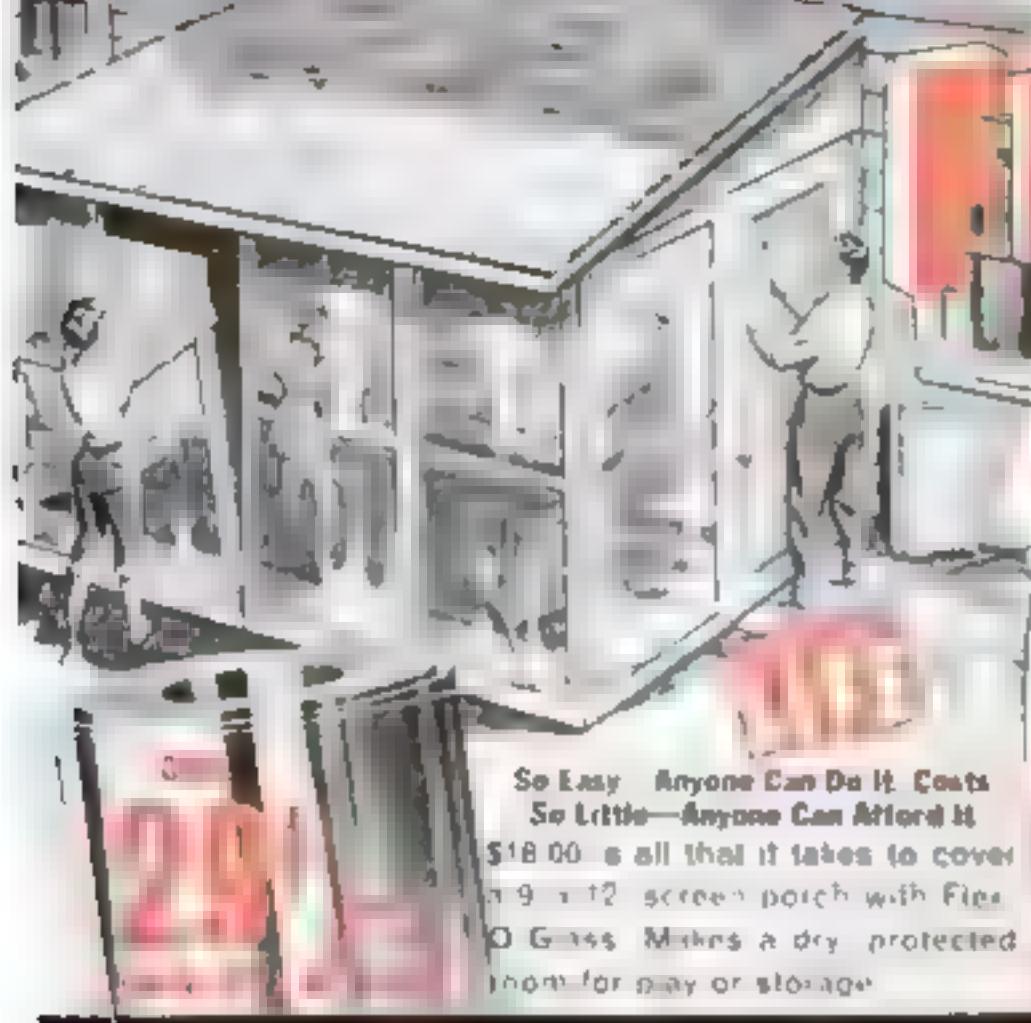
The designer's touch. Various orna-

Use columns and railings for room dividers



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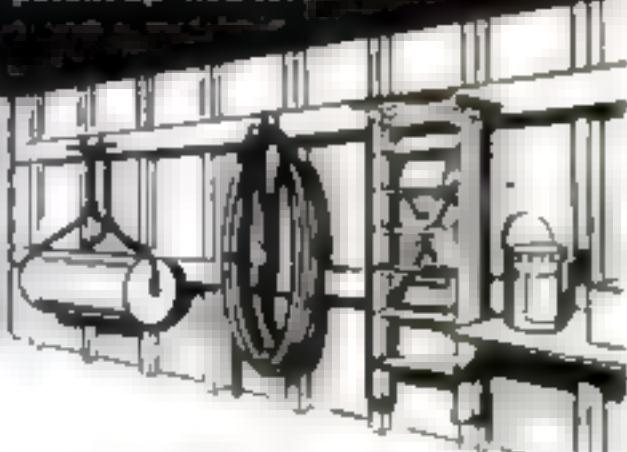


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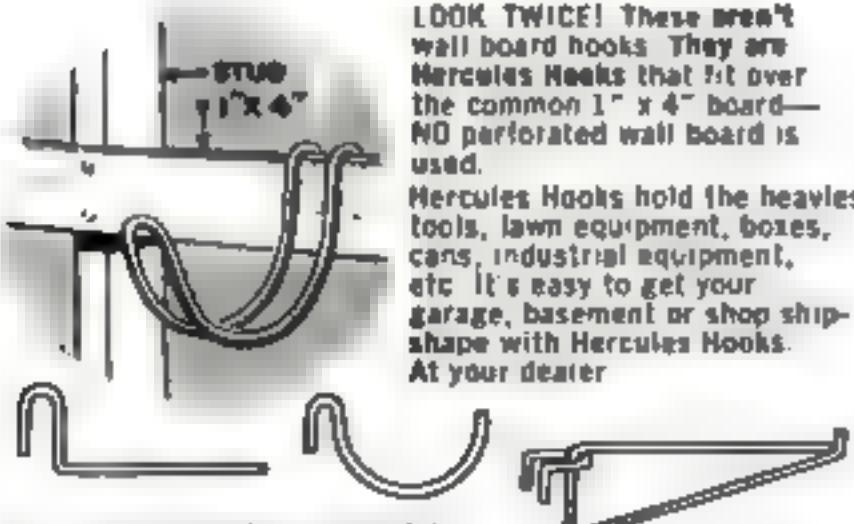
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LOOK TWICE! These aren't wall board hooks. They are Hercules Hooks that fit over the common 1" x 4" board—NO perforated wall board is used.

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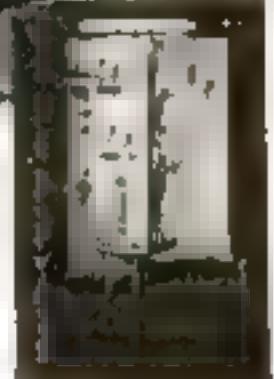
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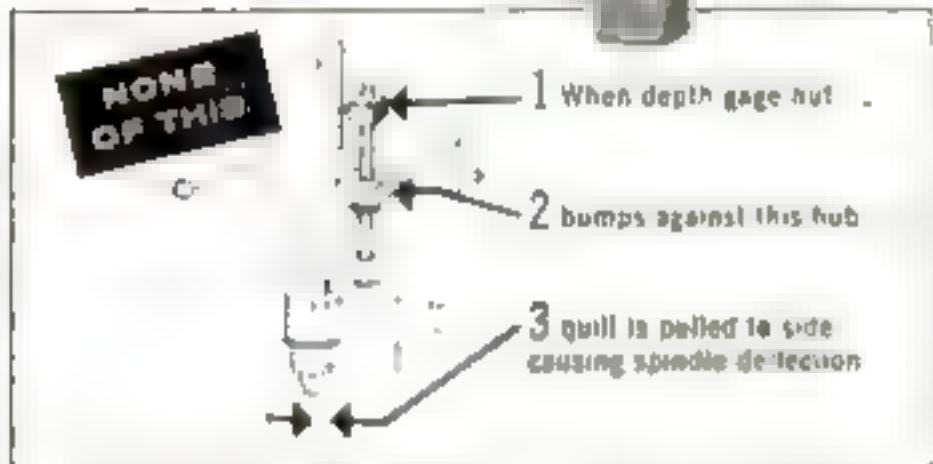
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Up to 36 months to pay



Use railings for patios and porches



ments of cast iron or flat steel may be bolted, screwed, or welded to the posts or railing pickets.

For the posts, there are ball and urn ornaments that screw to the top, and the traditional lamb's tongue. At the foot of steps, a scroll or S-shaped ornament may be added to the posts.

Ornaments for pickets come in a broad range of designs. Among them are shield, heart, diamond, scroll, and fleur-de-lis patterns, as well as leaf and floral shapes.

One prefab-iron producer also makes a rail capping intended to give the do-it-yourself installation a custom look. The capping, made in 6' and 10' lengths, snaps on the top railing and gives it a molded, convex surface.

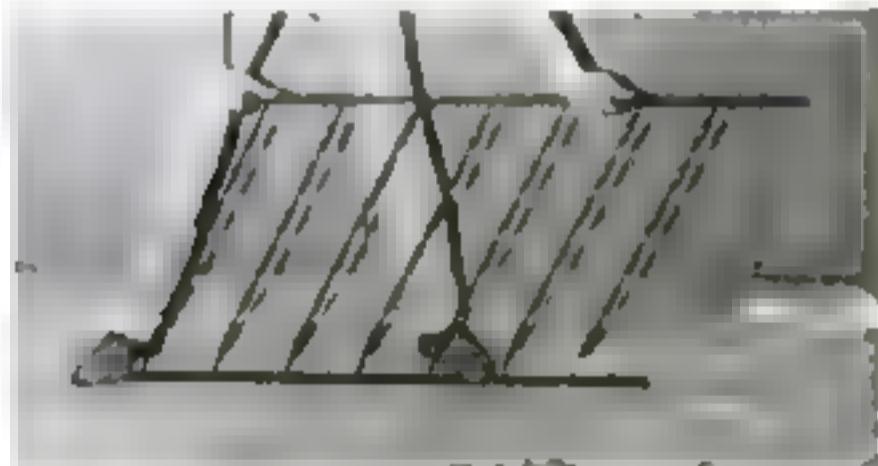
Columns, Southern-style. Columns capable of supporting several tons are also basic items in the prefab-iron inventory and are often used with railings. Outdoors, they support roofs for porches, terraces, and car ports. Indoors, they're

adaptable as room dividers, fastened between floor and ceiling.

Columns usually are 8' tall, but allow an average height adjustment of some 14". There are both flat and corner (right-angle) types. Columns are made of 1"-square steel tubing (like that used for posts), with welded, decorative steel or cast-iron inserts. Columns range in width from 9" to 20".

What about tools? For the installation job, you'll need a hammer, screwdriver, hacksaw, level, an adjustable wrench, and electric drill. Depending on what you'll be drilling, you'll need masonry-, wood-, or metal-boring bits.

Before you plan your job, check with your building-supplies dealer to see what he stocks. Prefab-iron producers put out parts sketches and work sheets that will help you. These tell what lengths of railing you'll have to work with.



HOW YOU ADJUST RAILINGS: Prefab railings are adjustable, as you see here, to fit any incline or flight of steps. To slant the section, you simply press down and to one side.

Surface mounting of posts is quickest and easiest. You simply drill two holes for screws to hold each base plate. Use lead expansion shields when sinking the screws in masonry.

For the utmost strength and rigidity in a masonry installation, you may still wish to sink the posts in their base. Each will need a hole about 1½" square and 2" or 3" deep.

Perhaps the easiest way to make such a hole is to chuck a masonry bit in your drill, drill out the corners of the square, and remove the center with a cold chisel.

When installing railings, you brace the posts temporarily while you measure, cut, and attach the railings. Both posts and railings are cut with a hacksaw. To simplify finishing, most prefab railings and other ironwork come already prime-painted in black or gray. ■ ■



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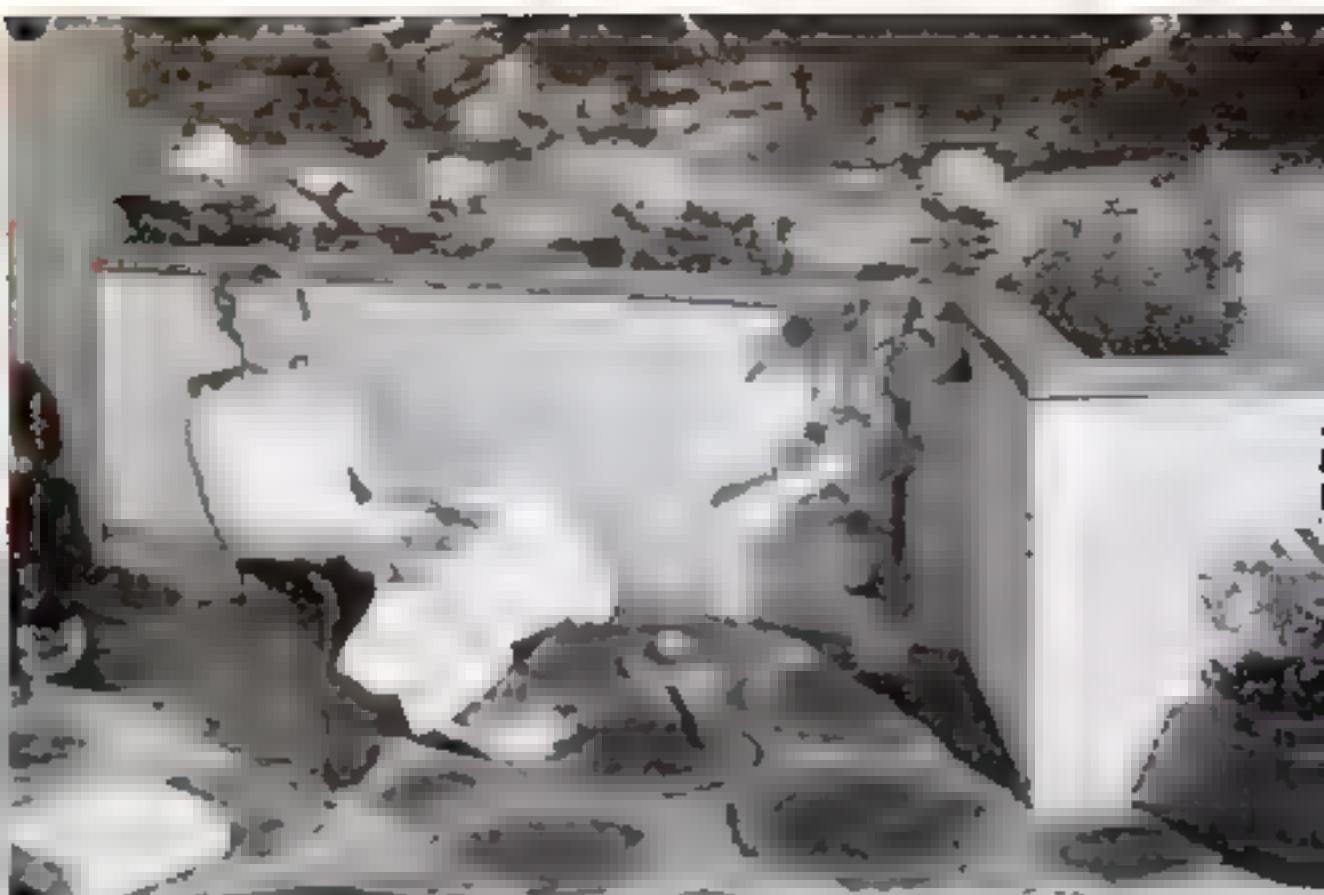
Powerful performance at low price is made possible by Weller's new *heavy duty* reciprocating motor. Full $5\frac{1}{2}$ " stroke—14,400 strokes a minute—and big 26 sq. in. sanding surface. Maintenance-free, too. No brushes, commutators or metal bearings to wear. Lubricated for life. And it's the *safest* sander on the market. Plastic handle, housing and plate, no exposed metal parts that can be energized, and 3-wire grounded power cord eliminate electric shock hazard. *Sands with the grain* for smooth finish unobtainable with circular or orbital sanders. *Guaranteed 1 year.*

Model 77 \$19.95

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Home Improvement Ideas



GRECIAN WHITE Z-BRICK gives a stylish face to the rough concrete-block planter shown under construction at left. The smartly angled planter doubles as a patio retaining wall at the California home of Mr. and Mrs. Darrell Holl.

A Planter That Fools the Eye

Behind the delicate brick facing is a rugged retaining wall of reinforced concrete block



SPECIAL ADHESIVE attaches the facing brick. A skim coat of the adhesive was first scraped on the block with a finishing trowel. Three gobs were then used on the back of each brick.

HERE'S an interesting new way to build a combination retaining wall and planter for a terrace. It starts with a crude but husky double wall of inexpensive concrete block. It finishes with a new kind of bricklike facing called Z-Brick.

The brick facing is made of vermiculite, cement, and coloring. It is so light in weight that it goes on with adhesive, needs neither foundation nor mortar. Units are $\frac{7}{8}$ " thick by $1\frac{1}{2}$ " by 12" and come in green, red, tan, and off-white.

Z-Brick, a product of Vermiculite Manufacturing Co., 2107 N. 34th St.,



ANY WOOD SAW, or a hacksaw, will cut the brick where special lengths are needed. A $\frac{3}{8}$ " round wood rasp is fine for duplicating the curved joint recess after a cut is made.

Seattle, was made originally for interiors. Since there is no need for a foundation, it can be stuck to an ordinary wall in remodeling a fireplace or kitchen. Recent tests, however, open up a whole new field of uses. They show that the bricks will stand up outdoors if placed on a permanent surface—concrete or other masonry, or asbestos-cement board, not wood.

This combination method allows you to build strong concrete-block walls without worrying about their crude appearance. And you can use the cheapest of blocks. The builder of the planter wall shown here gives the following account of how he went about the job:

"I put down a 4" slab of concrete with $\frac{3}{8}$ " reinforcing rods stuck into it. On this I built up my walls, using the thin type of 4" blocks. I ran the walls 9' out from the corner of my house, then added a 4' spur section at a 30-degree angle. For strength, I poured concrete into hollows containing the steel rods.

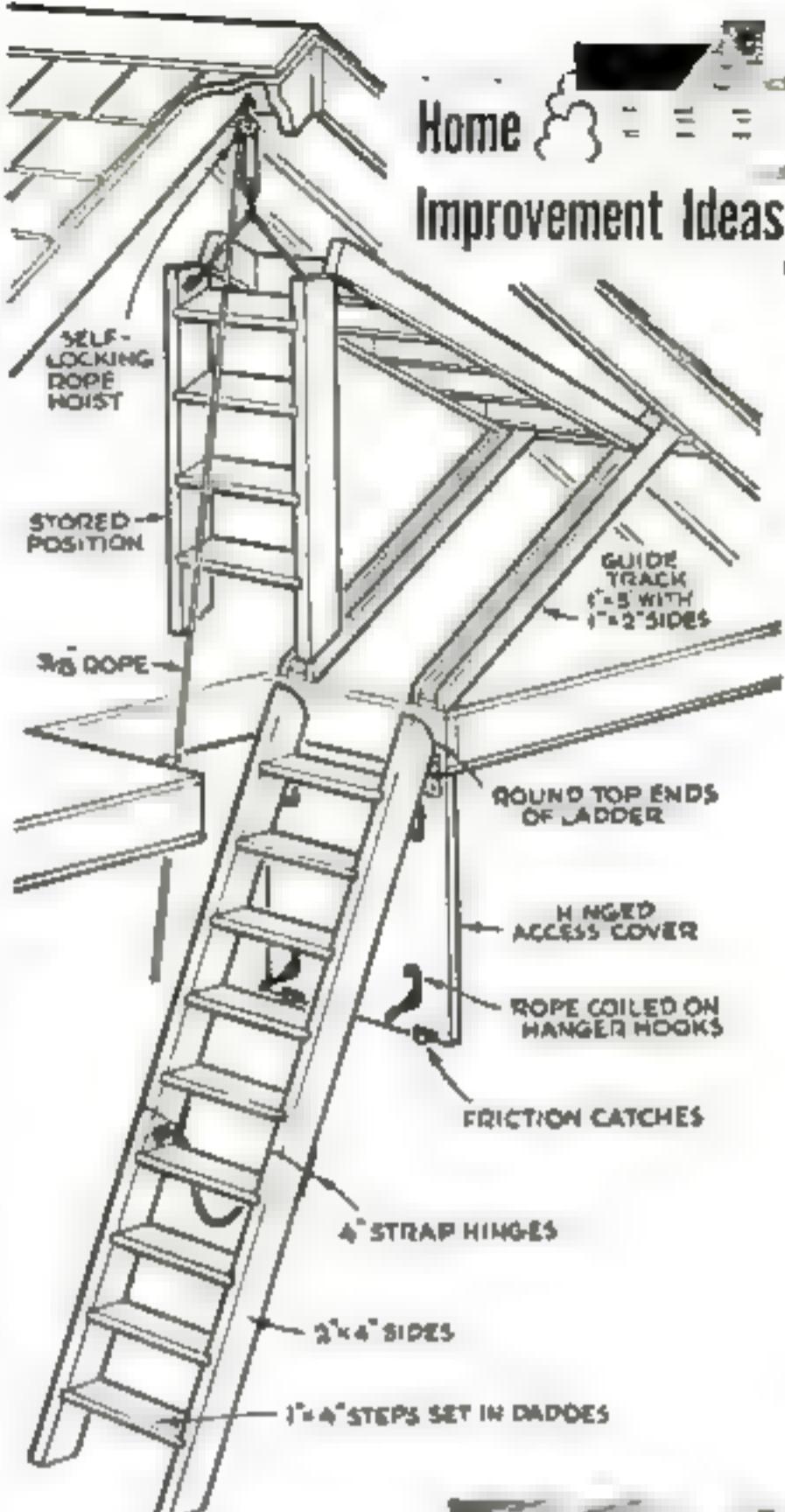
"Z-Brick can be laid from the top or bottom, but from the bottom up is easier. I placed a board at the base of the wall to give a straight edge. Because a planter gets pretty wet, I took the precaution of covering the blocks with a thin skim coat of the Z-Brick adhesive before applying the bricks.

"Z-brick goes on much like tile—it's the fastest part of the whole job. You just put three dabs of adhesive about the size of a quarter on the back of each piece. Then you slide the piece firmly into place sideways. At corners, I just butted the bricks together for a joint that I considered most bricklike. For an even slicker appearance, it would be easy to miter the corners.

"The bricks cut like wood with any hand or power saw. Shaping can be done with a rasp. I found they can even be ground to an exact fit by rubbing them on the rough surface of a concrete block. What could be simpler?

"I topped off the planter with two-by-six trim boards of redwood. These were cemented in place with the Z-Brick adhesive to avoid using bolts that would show. I then turned the job over to the gardening authority of the family. She planted hydrangea and pittosporum in a mixture of soil, sand, and peat moss. Of course, I take all the credit when visitors drop in and admire the fine results."

Home Improvement Ideas

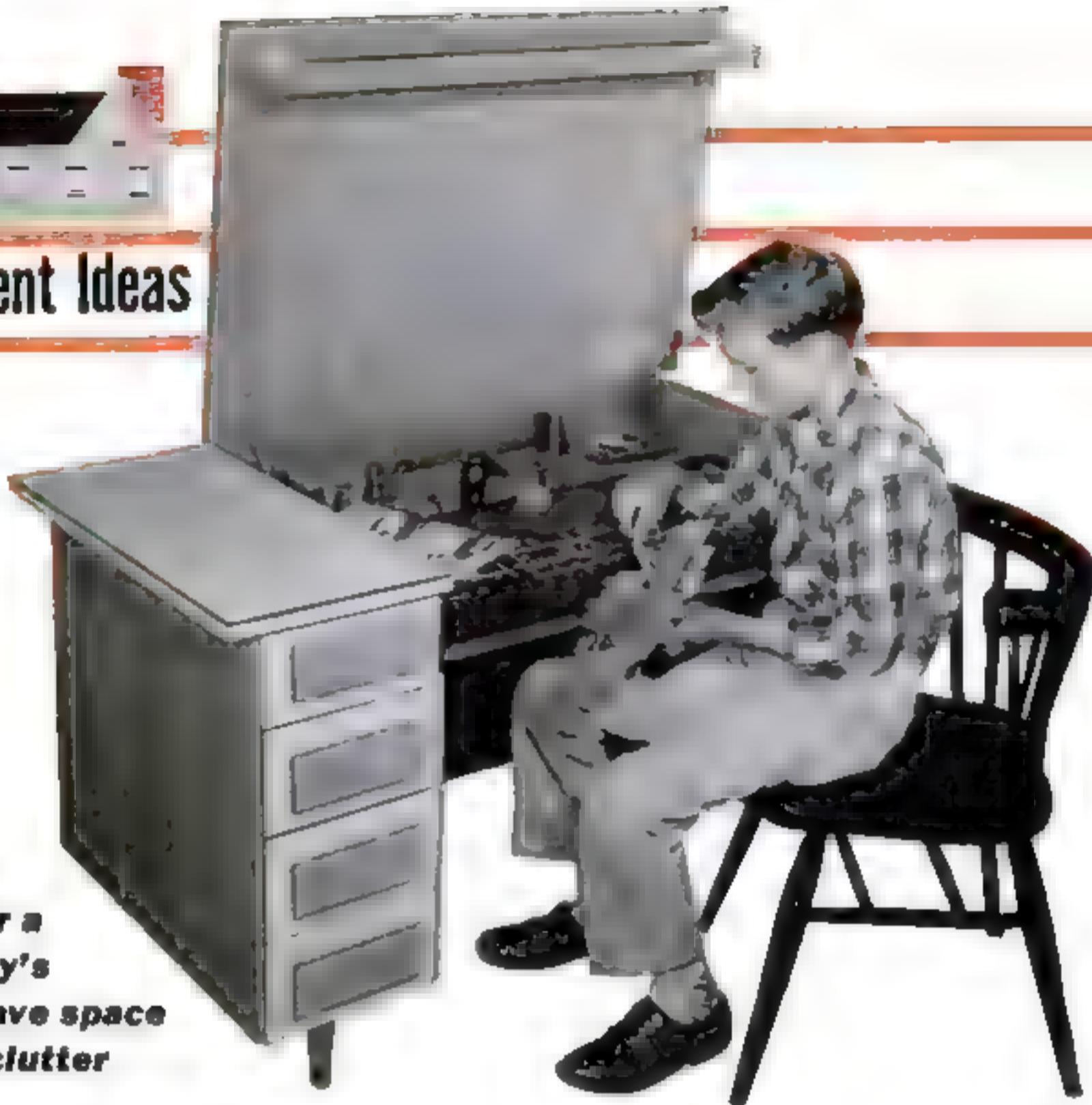


Stairway Folds Into Attic

THIS folding attic stairway will operate in tight quarters where you can't install a commercial swing-down stairway. As the lower section is pulled up by a rope, the hinged top section slides up into the attic on U-shaped tracks made by nailing one-by-twos to the sides of two one-by-threes. A self-locking rope hoist (Sears, Roebuck No. 9H78365) holds the stairs in the up position, and the rope is coiled around four hooks on the inner side of the hinged trap door. The stair sections, joined on the back with large strap hinges, become rigid when they are in the down position.



Here's just the thing for a teen-age boy's room—to save space and banish clutter



The Study Desk That Hides a Hobby Bench

IT'S hard to believe that such a handsome desk is also a practical workbench. But POPULAR SCIENCE planned this piece for double duty. When the lid's down, there's a 26"-by-48" study surface at the proper desk height of 30". Once the homework's done, the books are whisked into a drawer, and the desk is transformed into a hobby bench by just swinging up the lid.

Underneath, there's plenty of space to work on a boat model or hi-fi kit. A perforated board panel at the back (spaced

out with $\frac{3}{8}$ "-thick rubber washers to take hangers) keeps tools handy. And there's no rush to clear away before bed-time. The clutter can be left as is. With the lid dropped—and locked—the project-in-progress is safe from the kid brother's curiosity or Mom's urge to straighten up.

No fuss, no finishing. The desk's sleek good looks are achieved without hardware or fussy finishing procedures. And you can build it of inexpensive plywood. The secret: All visible surfaces are faced with a plastic-surfaced hardboard called



Marlite. Since it's impervious to dirt, grease, or ink, it's a cinch to keep clean. We used two types: $\frac{1}{8}$ " white for the top and drawer fronts, and $\frac{1}{4}$ " Swiss Walnut random plank for the sides and drawer pulls. The plank is actually a grooved wall panel like the American walnut pattern shown in the background above.

When applying the prefinished hardboard to large areas, use Marlite adhesive C-350. Small pieces can be bonded with white glue or contact cement. Cut all pieces a little oversize and plane them flush after they're attached.

Plans are simple, for quick construction. You can use $\frac{1}{2}$ " plywood throughout, but for greater stability we used $\frac{3}{4}$ " for the two-piece top, the four-piece workbench, and the notched right side. The recessed back of the drawer case is $\frac{1}{4}$ " plywood.

Build this case first, then make the drawers to fit. They're simple butt-joint boxes with $\frac{1}{4}$ " plywood bottoms. They don't need guides since they rest on dividers. Attached $\frac{1}{2}$ "-thick fronts hide all joints and overlap the case edges. Where they meet on a divider, each front overlaps halfway. The facing for the deep drawer can be center-scored or applied in two $5\frac{3}{4}$ " pieces, spaced a bit apart to simulate two drawer fronts.

Join the bench section to the drawer case and attach the screw-on legs and both top panels. The underside of the



THE WELLSAW 400 ELECTRIC HAND SAW

Yes, a Wellsaw 400 with a 16" blade* actually cut a house in two in 30 minutes (see page 82, July, 1961, POPULAR SCIENCE). While we don't think many people will want to do this, it is a dramatic demonstration of the practical utility of this unique saw.

You just can't match the Wellsaw 400 for versatility. You can do just about anything with it that you can do with a hand saw—saw flush with support... cut big posts or beams... trim trees.

Try a Wellsaw 400 at your dealer's or use the coupon below for further information.

*Also available with 8" blade.



Wells Manufacturing Corp.
300 Service Road, Three Rivers, Mich.

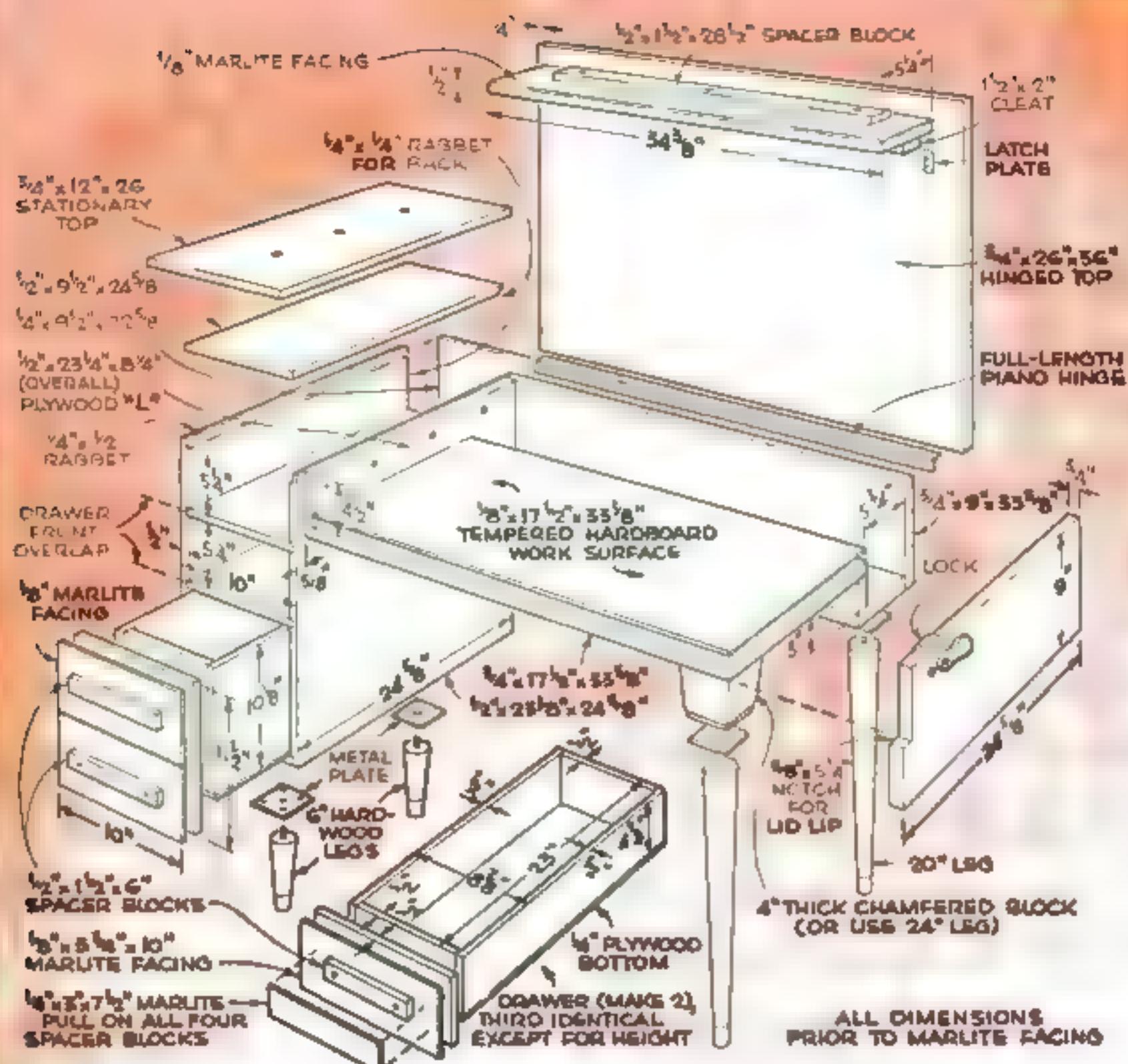
Send descriptive bulletin on Wellsaw 400
 Send name of nearest dealer

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Street _____

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PSM 951



FRUSTRATED MISCHIEF-MAKER can't lift lid to reach inside. Chest lock (inset) is Corbin's No. 34 from American Hardware Corp., New Britain, Conn. Note how facing extends past notch in side to hide edge of false drawer's frame.

MARSH WALL PRODUCTS, INC., has separate working plans for this versatile piece of furniture. If you like the convenience of working with such plans, address a postcard to Marsh Wall Products, Dept. PR-5, Dover, Ohio, asking for the desk-hobby bench plans.

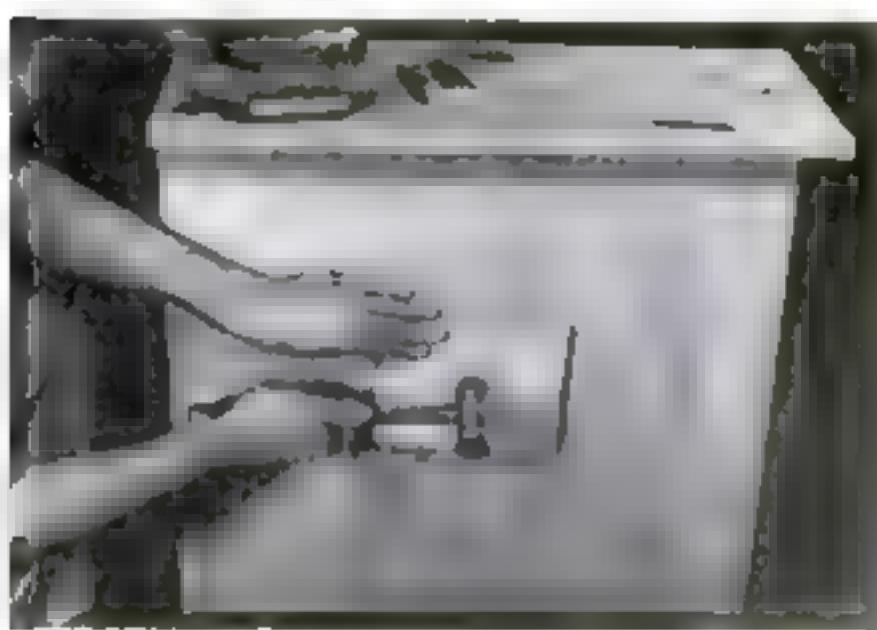
lid and the interior surfaces can be painted or stained—but leave the hardboard work surface unfinished. The top is propped open with a big hook and eye.

The plank facing for the sides of the drawer case should extend $5/8"$ at the front to conceal the edges of the drawers. The edge of the facing is covered with a metal molding, available where you buy the Marlite.

Simple plywood is faced with prefinished hardboard



ATTACH DESK TOPS to complete assembly. The large, lipped panel is hinged; smaller one is screwed on top of drawer pedestal. Metal moldings are added at the front of pedestal and workbench to conceal edges of the hardboard facings.



FACING GOES ON LAST. Though scored for random-plank effect, side is single panel. Apply with special adhesive and slide block across surface, tapping with mallet to assure firm bond. Attach hardboard work surface the same way.



WHITE FACINGS are bonded to drawer fronts with contact cement. Before attaching spacer blocks, paint edges black, bore lead holes and countersinks. Wood-grain Marlite pulls are centered on blocks, cemented, and clamped.



New from Reynolds!

Aluminum Corner Posts

Reynolds Aluminum Corner Posts are the easy way out of any cornering problems.

- No butting of joints
- No exacting angle measurements
- No elaborate corner finishing

And they're easy to use! Just slip the material into the open slots on either side and screw or glue into place. That's all there is to it. Corner posts may also be extended to form legs or supports on chests, cabinets or desks. Storage chests, paneled walls, furniture . . . all take on a real professional look. Available in 8 ft. sections to match any cuts, without waste, made from standard 4 x 8 ft. panels; for $\frac{1}{4}$ ", $\frac{1}{2}$ " or $\frac{3}{4}$ " thick materials. Reynolds Aluminum Corner Posts are now available at your hardware or building supply dealer; see them soon!

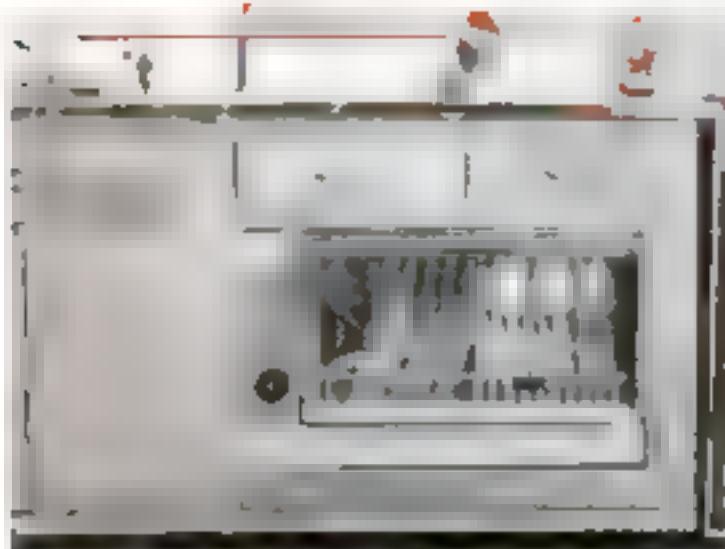
Watch Reynolds TV show, "Harrigan & Son," Fridays, ABC-TV



REYNOLDS METALS COMPANY

Richmond 18, Virginia

Home Improvement Ideas



A slim new dishwasher fits into almost any kitchen layout. Patterned after the flexible-design concept used in cooking-range units, the dishwasher will go just about anywhere—tucked into an existing cabinet, hung below it, placed on top of a

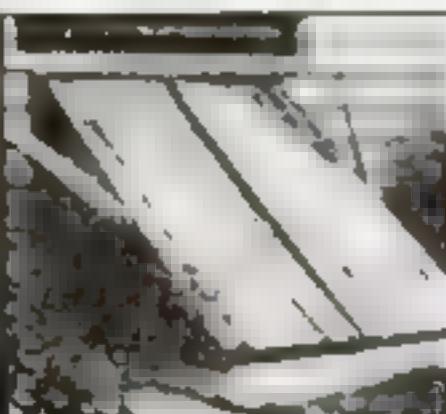
What's New



counter, built into a wall, or used as a portable on a wheeled stand. The smallest of three models is only 13" deep, 15" high, and 30" wide. A new operating principle is said to save water and cut washing time in half. After dishes have



Has the face of our house changed?



We used to have this old basement door.



Till we heard about all-steel Bilco.



And replaced our old door.

Spring balanced Bilco Doors open at a touch... lock securely... are weathertight, cost so little! The door used on thousands of new homes!

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Please send me your fully illustrated folder and name of local dealer.

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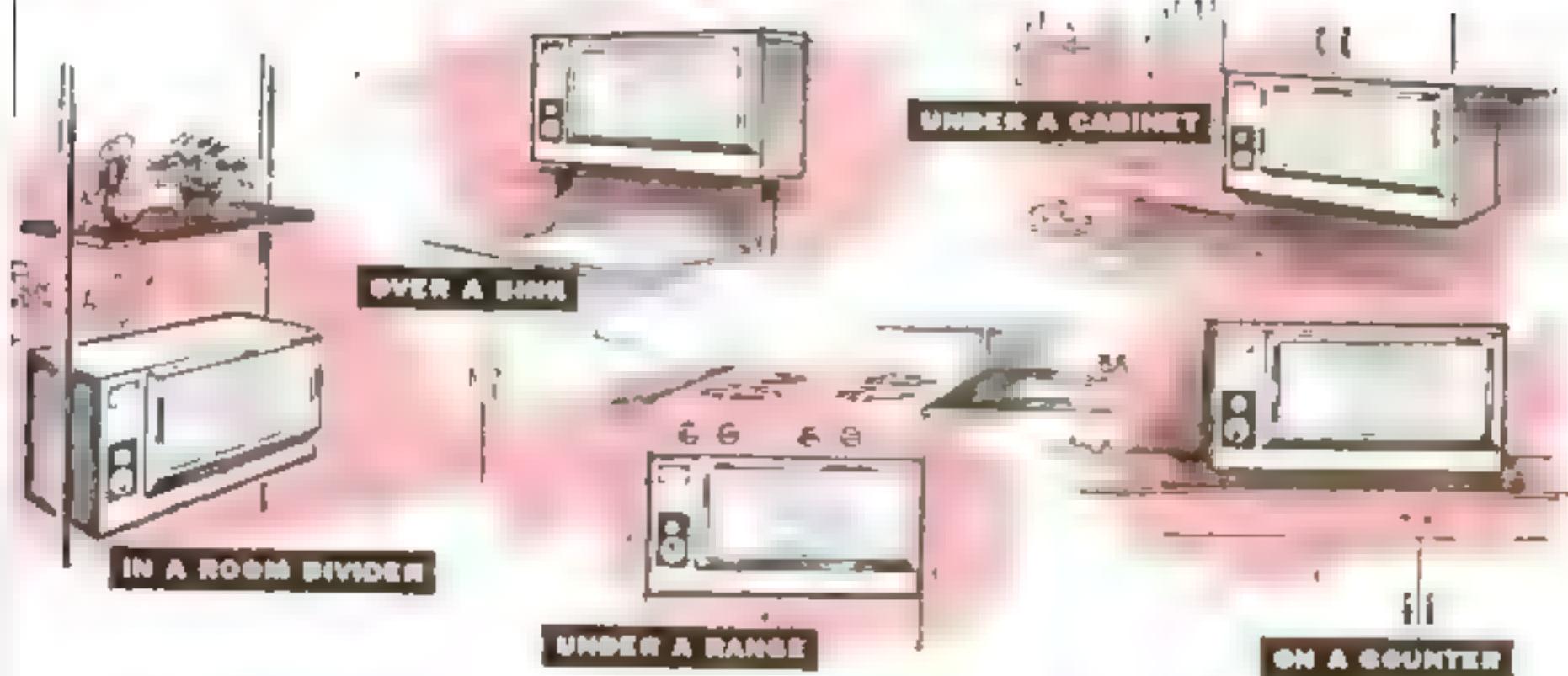


America's #1 Quality Finish

Fast dry, trouble-free. Nothing else to use from raw wood to final coat. Wherever paints are sold, or write for FREE Finishing Chart Folder.

P.O. Box 2216, Dept. PS-9, Torrance, Calif.

for Home Improvement



been washed, they are steam-treated for 12½ minutes. The steam comes from a built-in generator that creates its own distilled water to eliminate mineral spotting of dishes.

Complete cleaning takes only 25 min-

utes, after which the steam-hot dishes are air-dried. Because the water is recirculated, only nine gallons are used in all. Ling-Temco Electronics, Inc., P.O. Box 6191, Dallas, Tex., sells the dishwashers for about \$200 up.

CONTINUED

ARROW'S T-50 All-Purpose Heavy Duty STAPLE GUN

rip the gun that gets the job done *faster, easier and better!* It's a breeze! One *squeeze* and it's tiled — with Arrow's *one-hand operated* T-50 automatic Staple Gun! And you always have *both* hand *free* to position work or balance self! This rugged, all-steel, jam-proof professional tool built for a long life of smooth, trouble-free operation!

Uses 6 staple sizes:
1/4", 5/16", 3/8", 1/2", 9/16"
and ARROW'S CEILTILE STAPLE
specially Designed for Ceiling Tile



shoots A Staple Wherever You'd Drive a Nail



CEILING TILE



INSULATING



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WIRE FENCING

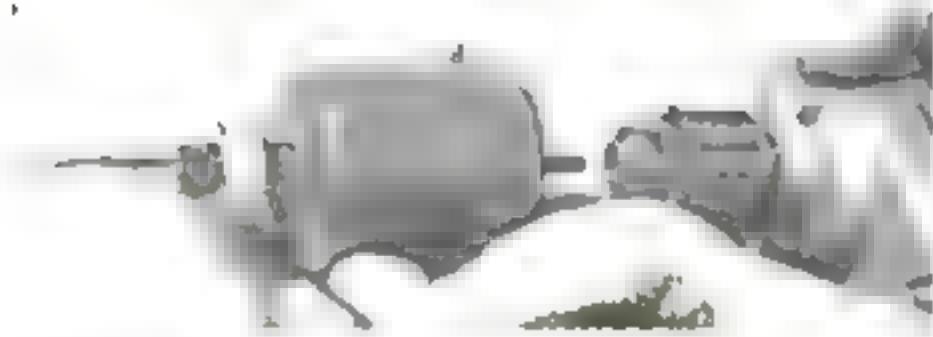
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4. Versamatic runs in reverse for removing screws. You won't believe how easy it is until you try it.

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PRECISION  PRODUCTS

Home Improvement News



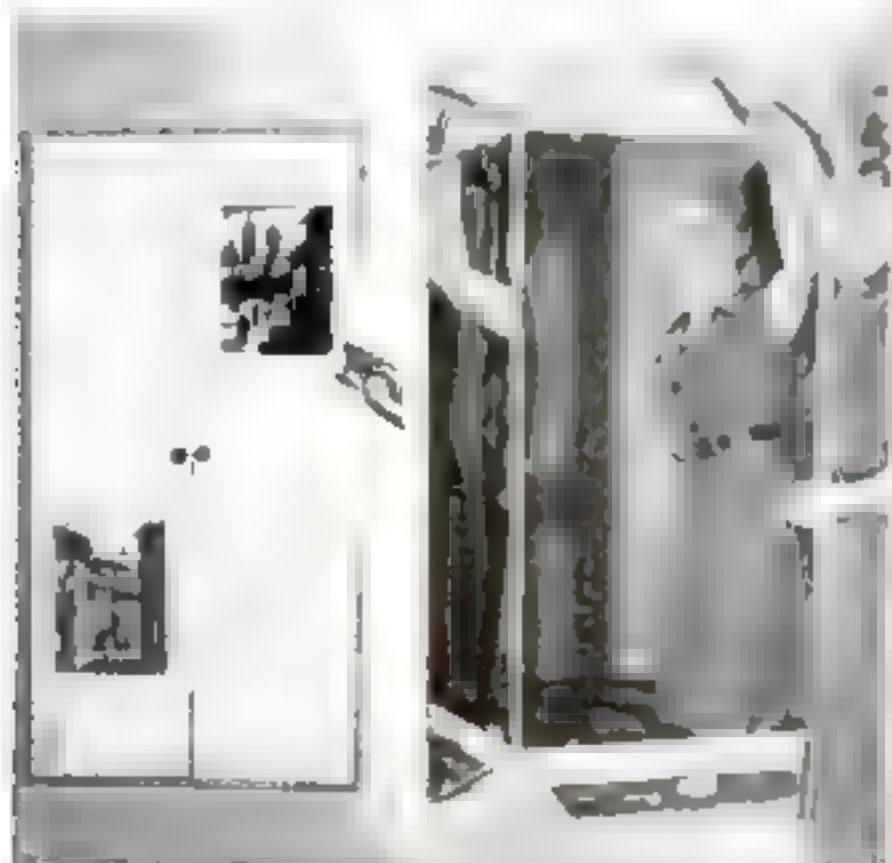
Gutters won't clog with leaves if they're capped with these strips of galvanized screening. The strips slip under the shingles, and the outer edges clip to the gutter. They're sold in 3' lengths for 59 cents each by Reynolds Div., National-Standard Co., Dixon, Ill.



You can spray insect-killing fog over your whole yard quickly with this electric "gun." Oil-base insecticide is first atomized by a nozzle, then vaporized by heat into a thick cloud that kills both flying and ground insects. With the heat tip removed, the gun can be used as a conventional sprayer for weed-killer and other garden chemicals. It sells for about \$40 from Burgess Vibrocrafters, Inc., Grayslake, Ill.



New life for an old roof can be painted on with a rubber coating said to add 15 years of use at about a third the cost of reroofing. Designed for asphalt roofing, the coating seals leaks and cements down loose shingles and surface granules. It can be brushed, rolled, or sprayed on. A gallon covers 80 to 100 square feet, sells for about \$6. Superior Paint and Varnish Corp., 3065 N. Rockwell St., Chicago, makes the coating in four colors, including white for high heat reflectance.



You can build this three-view mirror yourself from plans offered free by the Masonite Home Planning Service, 111 W. Washington St., Chicago. Ideal for a dressing or sewing room, it folds flat, taking up no floor space. Cost is about \$35, including the three 4'-tall mirror panels. Pictures, shelves, or sewing supplies can be hung on the perforated-hardboard back panels.

CONTINUED

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All shapes, styles and sizes to the user's
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2. **Irwin No. 22 Micro-Dial expansive bit**. Fits all hand braces. Just dial your size. Bores 35 standard holes, $\frac{1}{8}$ " to 3". Only \$4.00. No. 21 small size bores 19 standard holes, $\frac{1}{8}$ " to $1\frac{1}{4}$ ". Only \$3.00.

3. **Irwin 62T Self-Center hand brace type**. Only 16 turns to bore 1" holes through 1" wood. Double-cutter boring action. Sizes $\frac{1}{4}$ " to $1\frac{1}{2}$ ". As low as \$1.05 each. **EVERY IRWIN BIT** made of high analysis tool steel, heat tempered, machine sharpened and highly polished, too. Buy from your independent hardware, building supply or lumber dealer.

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New and improved Irwin self chalking design. Durable aluminum alloy box. Practically damage-proof. Fit pocket or hand. 50 ft. and 100 ft. sizes.

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Prefab walls go up so fast that an entire house can be enclosed in one day with these stressed-skin wall panels. Developed by Johns-Manville, they consist of insulated load-bearing sections for exterior walls, complete with door and window headers, plus panels for partition walls. Outside walls may be finished in board-and-batten style or with shingles or masonry. Interior walls are ready for paint or paper.



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Please send free 6-page Folder on PELLA WOOD FOLDING DOORS.

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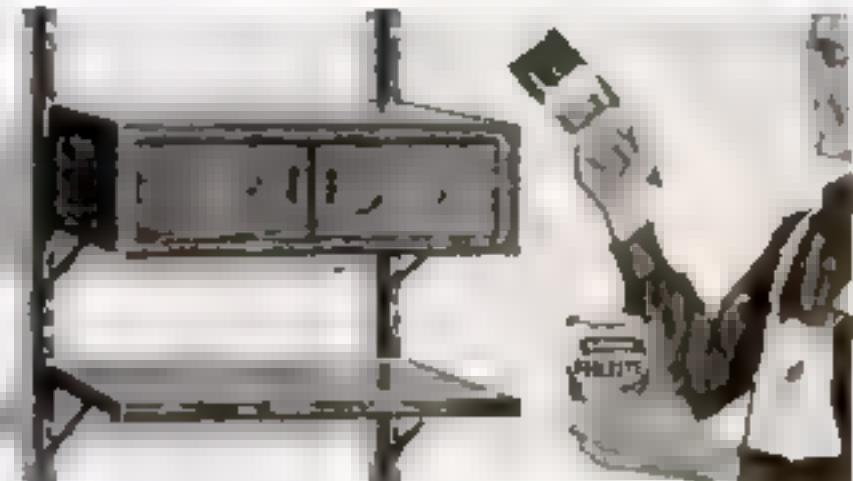
STATE



A real masonry fireplace can be added to your home in a new, easy way for as little as \$275. The secret is a metal form that gives you the basic shape—you simply add a masonry facing, hearth, and mantel around it. The form, guaranteed smokefree, includes firebox, smoke chamber, downdraft shelf, and built-in damper. You also get tubular flue sections that go up through the house and a simulated masonry chimney for the roof. Complete units, including 12' 9"-high flue, sell for \$208 for 24" logs, \$221 for 28" logs. The Heatilator fireplaces are made by Vega Industries, 714 E. Brighton Ave., Syracuse, N. Y.

►►How to protect your home against lightning is told in a free booklet, *Lightning Facts and Figures*, offered by the Lightning Protection Institute, 53 West Jackson Blvd., Chicago. It gives tips on avoiding lightning damage. ■ ■

New from Weldwood® DEEP FINISH FIRZITE Penetrating Sealer-Finish



Oil finish without rubbing. New Deep Finish Firzite® produces a beautiful Danish-type "hand-rubbed" effect. Just brush on, wipe off!



Almost indestructible floors. Deep Finish Firzite penetrates the wood fibers—producing a beautiful low-luster finish that wears with the wood.



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FREE—8-PAGE BOOKLET "Professional Gluing And Wood Finishing Guide." For free copy, write: United States Plywood, Dept. PS 9-61, 55 W. 44th St., New York, New York.

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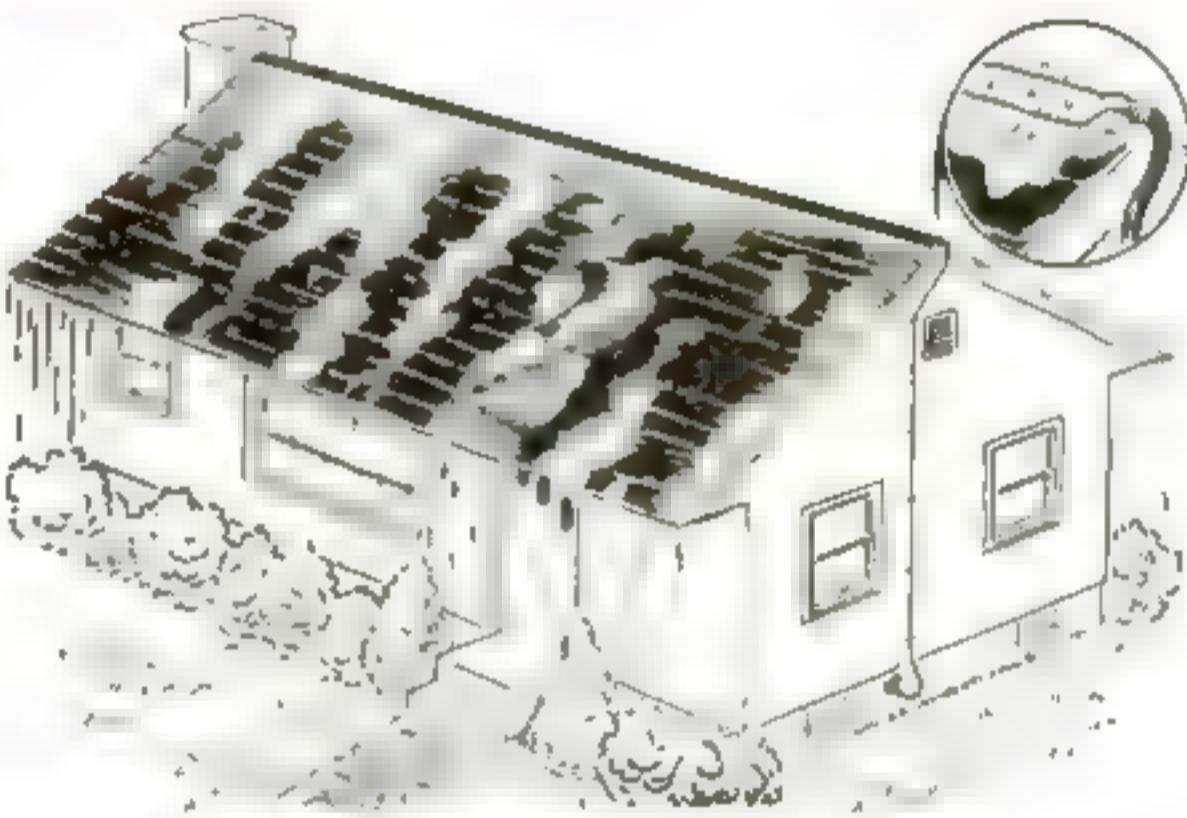
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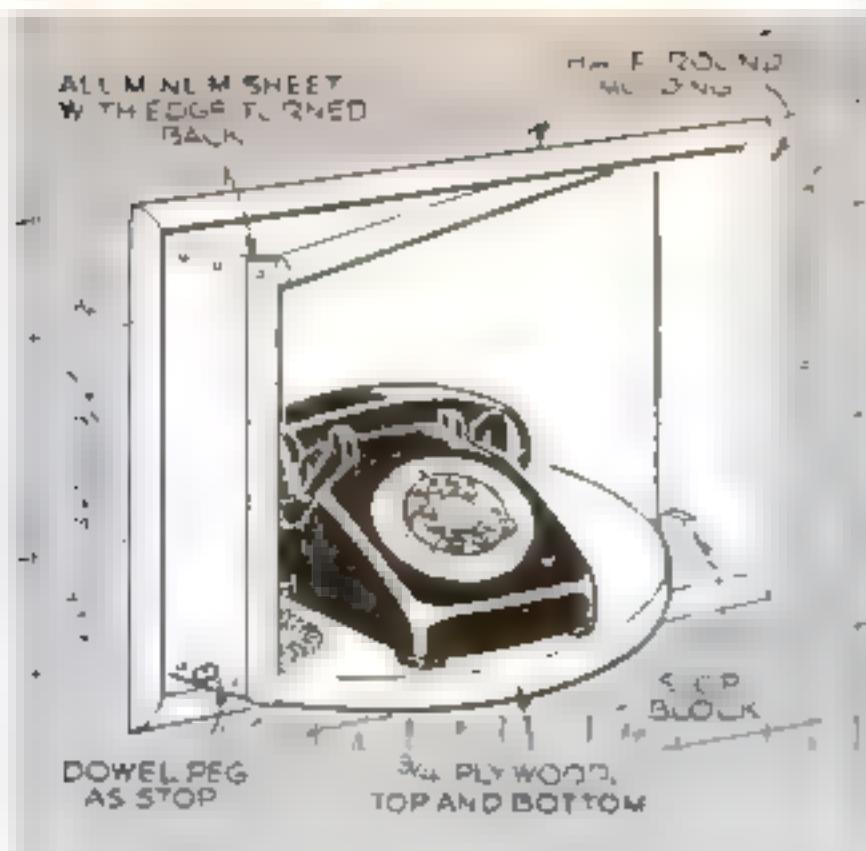
Prize-Winning Home Improvement Ideas

Here, and on the following pages, is a selection of ideas that won prizes or special awards in the recent PS contest

To cool his home on hot summer days, A. E. Brochon, Old Lyme, Conn., ran a copper-tubing water line up to a soil-soaker hose stretched along the peak of the roof. Dripping water evaporates from the roof, cooling the house below. Any runoff just waters the flowers and shrubs at the sides of the house.



This study corner was designed and built by Drayton Deen, Stillwater, Okla., for his teenage daughter's small bedroom. The drop-leaf desk is lighted by a fluorescent fixture attached beneath the drawer section. Open shelves and a cupboard provide lots of needed storage space.



To save steps in answering the telephone, E. C. Toman, Allentown, Pa., has made it accessible from adjoining rooms. The instrument revolves on a turntable in an opening in the wall. Half of the turntable is enclosed with aluminum, blocking the opening. The telephone line is in the wall and passes through the center hole of the turntable. A stop keeps the line from twisting.

Home Improvement Ideas



A Northern barn in small size was built in the back yard by F. W. Smith Sr., Miami, Fla., to solve the problem of no storage space in the house. "The barn's loft gave us the needed space and the kids love to use the lower part as a playhouse, rain or shine," he says. The miniature building is 8' by 12'.

WILHOLD GLUE FOR EVERY HOME IMPROVEMENT JOB

WILHOLD
Glue-Bird
WHITE GLUE

- GRABS FAST
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WITHOUT shims,
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Wonderful way

This remover penetrates coat-after-coat of the toughest finishes. Can be used indoors or out.

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Paint, enamel, varnish, etc. come off clean in one easy scraping - not coat by coat.

WONDER-PASTE REMOVER

At paint and hardware stores. Write for Wonder-Paste folder.

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PAINT-HARD BRUSHES are ready to use in minutes when you use Imperial Brush Cleaner. Acts instantly. Leaves bristles glossy and springy. Economical - used liquid can be saved for future cleaning.

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Write for free folder "Care of Paint Brushes"

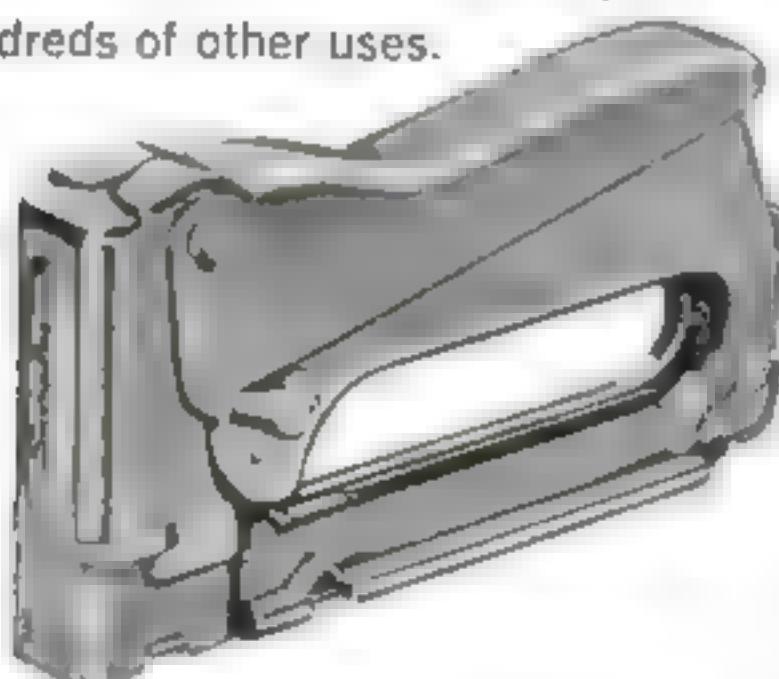
Wilson-Imperial Co., 121 Chestnut St., Newark 5, N.J.

IMPERIAL Brush Cleaner



To get more counter and storage space, Irwin A. DeGraff, Winthrop Harbor, Ill., combined this kitchen snack bar with a swing-out rack for cans. The hinged rack has vegetable bins at the left end and rolls on a caster at the outer end.

screens, upholstery, carpets...
hundreds of other uses.



Swingline 101 Staple Gun

Staples practically anything. Exclusive push-button loading and built-in staple extractor. At your stationery, department or hardware store.

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"TIPS FOR TACKING" Booklet

shows you how to save time, money and effort—with a Swingline Automatic Staple gun. Send for yours today!



Swingline INC.

32-00 Skillman Ave., Long Island City 1, New York



To hide garbage cans, Thomas L. Robey, Larchmont, N. Y., built this slide-out carrier. Roller-skate wheels mounted under a plywood platform roll out on rails of 2" pipe. The carrier holds two cans, fits under a roof overhang.

OLD DOOR CLOSER ROUND-UP



Here's the all hydraulic closer that solves your storm and screen door closing problems. No more heel bumping, failure to latch or constant adjustments — when you have a Glidraulic

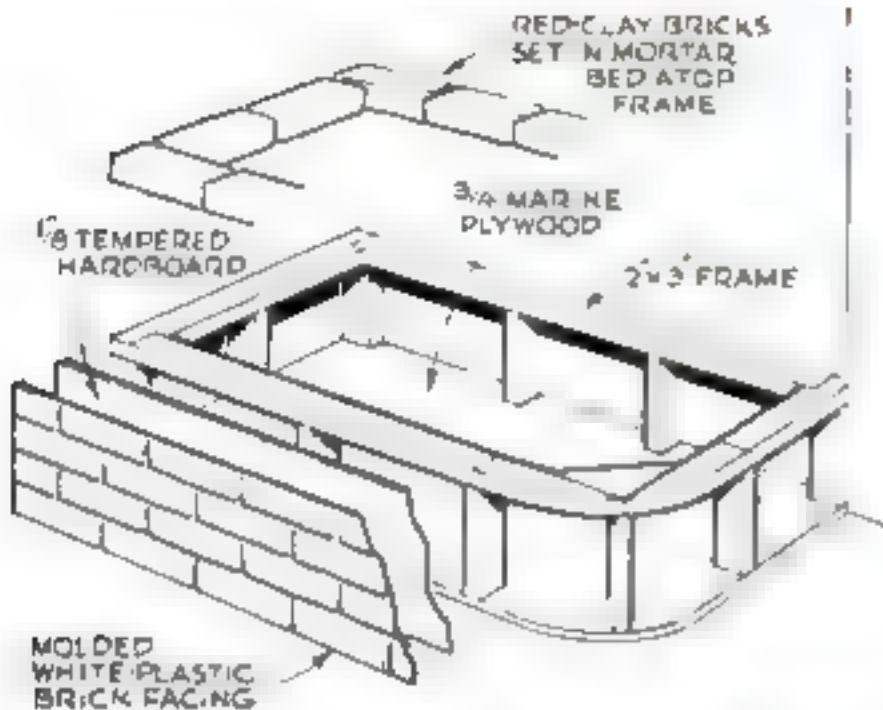
- 15 Year Guarantee
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A built-in planter solved a decorating problem for J. R. Tucke, Pittsford, N. Y. It's located in a corner of the vestibule between the front entrance and a closet door. Potted plants and vines are kept in the enclosure sketched here.



Space under a cellar stairway, closed off by adjoining walls, was made accessible for storage in the home of D. W. Vandeven, Syracuse, N. Y., by hinging the lower stair treads. A screen-door hook holds up each tread.

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WHEN YOU BUY YOUR COMET QUICK-SET DADO

—during this special offer, you will receive free sharpening by factory experts for the lifetime of the blades! You will receive a Certificate with your purchase of any Comet 6" or 9" Quick-Set Dado. This Certificate (plus \$1 for insurance, postage

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COMET MANUFACTURING COMPANY

A. G. Comer — 1951



Short Cuts and Tips

FROM THE PRACTICAL WORKMAN



Adding Holders to a Fire Set

Few stands for fireplace tools are equipped with an individual holder for each implement. Jumbling three or four together in one loose bracket makes it hard to pick out the tool you need. Make separate hangers by hacksawing $\frac{1}{2}$ " sections from $\frac{1}{4}$ " pipe and then cutting

slots in the sides of the rings wide enough to take the tools' shafts. File the rings smooth and drill a hole in each one for a small machine screw. The rings can be fastened to the arms of the stand with nuts; or, for a neater appearance, turn the screws into threaded holes tapped in the stand.—*Herbert G. Eidson Jr., Winston-Salem, N. C.*



Brighten and protect your home with

SUPER PLY

the high gloss enamel that's so easy to apply!

This alkyd enamel is ideal for kitchens, bathrooms, woodwork and furniture. Keeps its brilliant porcelain-like finish after repeated scrubbings. So durable, people even paint boats with it!

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for walls, ceilings, woodwork
Just brush or roll it on... no laps or brushmarks, no trace of touch-ups. Dries in 20 minutes... no unpleasant odor.
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THE POCKET SIZE MACHINE SHOP

Dremel Moto-Tool

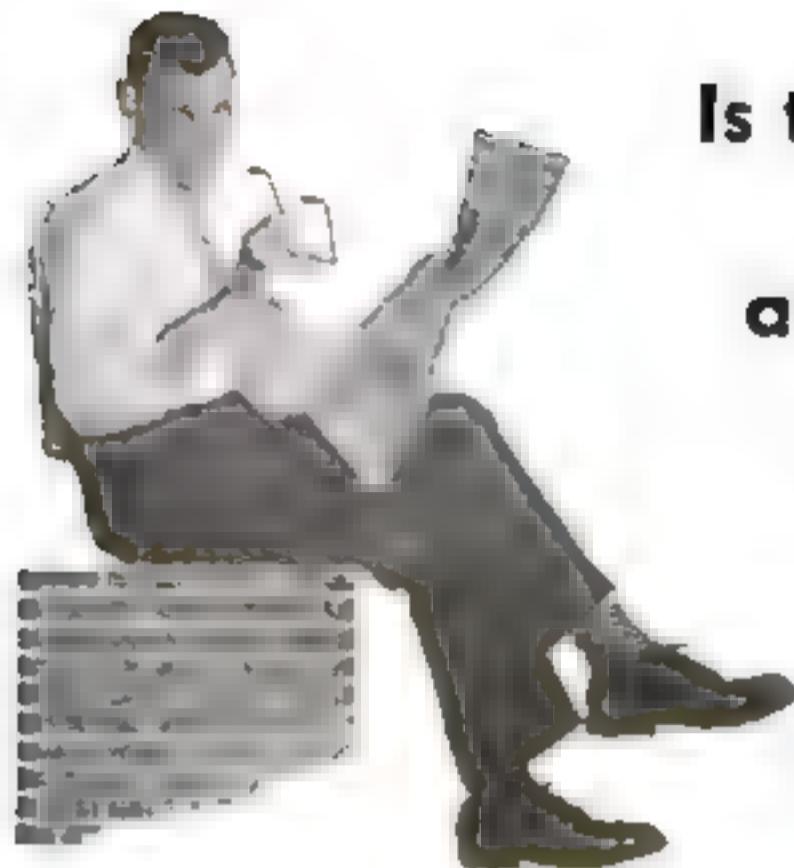
In your workshop, on your job — it's the handiest tool you'll ever own! Moto-Tool is ideal for precision grinding, polishing, carving, drilling, engraving, deburring, sharpening — does fine detail work with pin-point accuracy. It eliminates time-consuming hand work, gives the finished job a professional look. Moto-Tool weighs only 13 oz. — fits your hand like it belongs there. Fastest, most powerful tool of its kind — develops 27,000 rpm! Widely used by tool and die makers, model builders, craftsmen, lab technicians, repairmen, gunsmiths, schools.



Moto-Tool Kit No. 2 with steel case \$27.50
No. 2 Moto-Tool only \$19.95

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Quality Power Tools Since 1934



Is the top of your chimney the warmest place around your house?

Stack temperatures are cut as much as 200 degrees by this new Iron Fireman CUSTOM Mark II oil firing with Volumetric Combustion

Saves fuel? Of course! When you stop that much heat from blowing into the sky you've got to save fuel . . . lots of it.

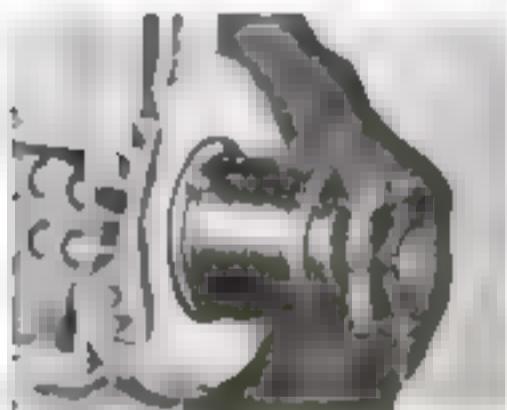
Saves fuel, eliminates smoke and soot, substantially cuts service costs

Mr. Francis Woodworth, Center Junction, Iowa, tells us: "This is the furnace that cut my fuel bill in half. It operates without smoke, soot or odor. The service expense so far is nil." Hundreds of such letters report fuel savings of 18 to 50 per cent. How is this accomplished? First, Volumetric Combustion not only reduces stack temperatures, but it practically stops standby loss (furnace heat lost through the chimney during "off" periods when the burner is stopped), which is the most serious waste of all. Second, the moment the burner starts, it transfers

heat into the system at the full maximum rate. No "warm-up" period; no delay while refractory heats. CUSTOM Mark II heating systems respond more quickly and shut off more quickly. Third, it burns fuel completely—no residue of smoke or soot, even when starting in a cold firebox. You prevent this waste, and also cut service troubles to almost nothing, because soot causes about 90 per cent of service calls due to coated heating surfaces, fouled electrodes, carbonized oil nozzles.

Mail coupon for further information, sent free.

HERE'S THE SECRET OF VOLUMETRIC COMBUSTION



Natural chimney draft is erratic, unpredictable. The Combustion Flow fan (left) creates its own draft. No chimney draft is needed—simply a vent pipe through the roof (local codes permitting).

At the start of the firing cycle the fuel and air injector (right) supplies excess air to insure complete combustion. As the furnace warms up the air supply is diminished. A natural draft burner cannot make this critical adjustment and therefore starts with an air-starved, smoky flame. (Fifty or more starts a day)



CUSTOM Mark II fuel economy is due partly to its smokeless, sootless flame (smoke and soot are unburned fuel), and partly to its sealed combustion chamber which prevents the loss of furnace heat through the chimney or vent after the burner turns

off. No other firing system has ever eliminated this serious standby loss. Iron Fireman CUSTOM Mark II oil firing is available in a wide range of sizes for warm air, steam or hot water heating in homes or small commercial installations.

CUSTOM Mark II heating — white glove clean



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comfortable or home heating.

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Address _____

City _____ State or Prov _____

**How to build a
rear-projection cabinet for—**

A Home Theater Wall

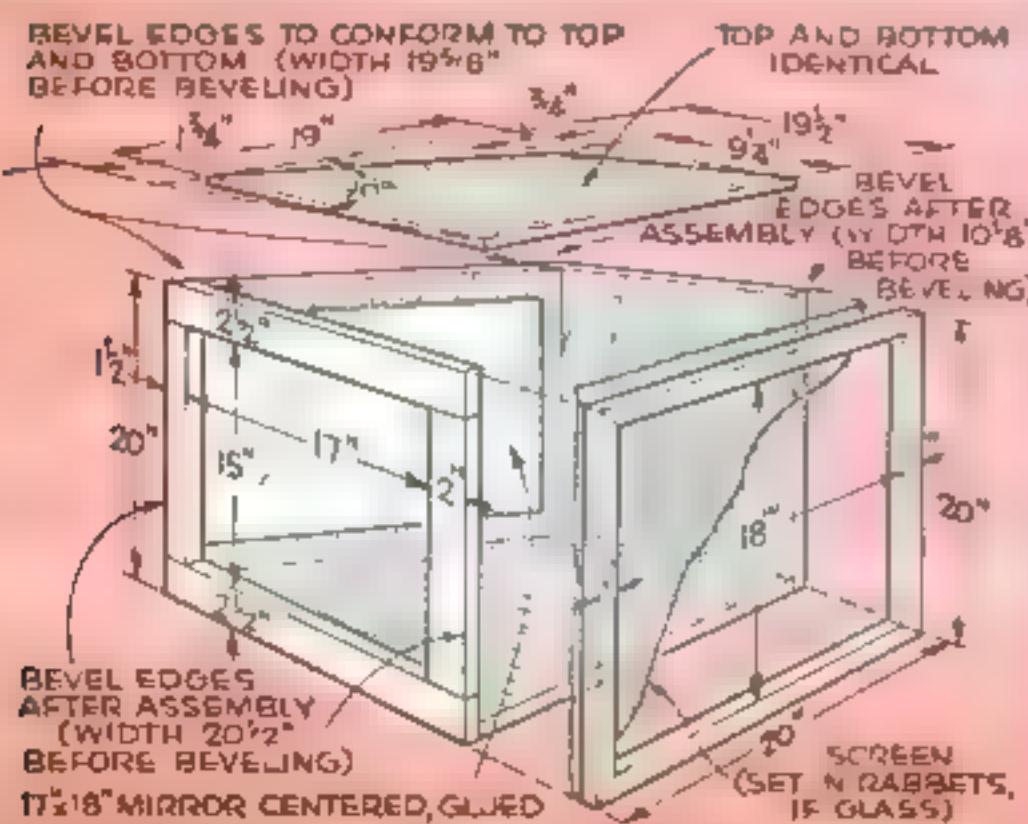
YOU can have your own home theater for viewing movies or slides with this rear-projection cabinet that can be built right into a wall or room divider. Placed alongside a TV set or hi-fi, it gives you a complete entertainment center for putting on shows. The projector remains permanently set up—you just start it going and sit back and relax.

The design comes from a new booklet entitled "Rear-Projection Cabinets," available free from Eastman Kodak Co., Rochester 4, N. Y. It's a trick done literally with mirrors. The projector is aimed through the side of the cabinet, and an angled mirror at the back reflects the beam onto a viewing screen.

The image is reversed by the mirror, but is then re-reversed correctly when you view it from the front. Projectors with long-focal-length lenses must be moved a few feet away to gain a full-size image. A low projector should be blocked up level with the mirror's center.

What kind of screen? The cabinet's back panel is automatically at the correct angle—you merely cement the mirror to it. Several types of rear-projection screens are available from photo dealers. Even white beaded-plastic shower curtain will work. Your best bet, however, is a special black screen made for the purpose. It produces brilliant images and can be viewed in full room light.

A plastic version, called 3-D Black, comes 20" square for \$6.75 from Trans-Lux Corp., 625 Madison Ave., NYC. A black-glass screen, also 20" square, is sold for \$16.50 by Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N. J. (order number 85,131). To avoid cutting the glass, the cabinet's opening can be enlarged slightly. The plastic can be cut with scissors.



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PS-661

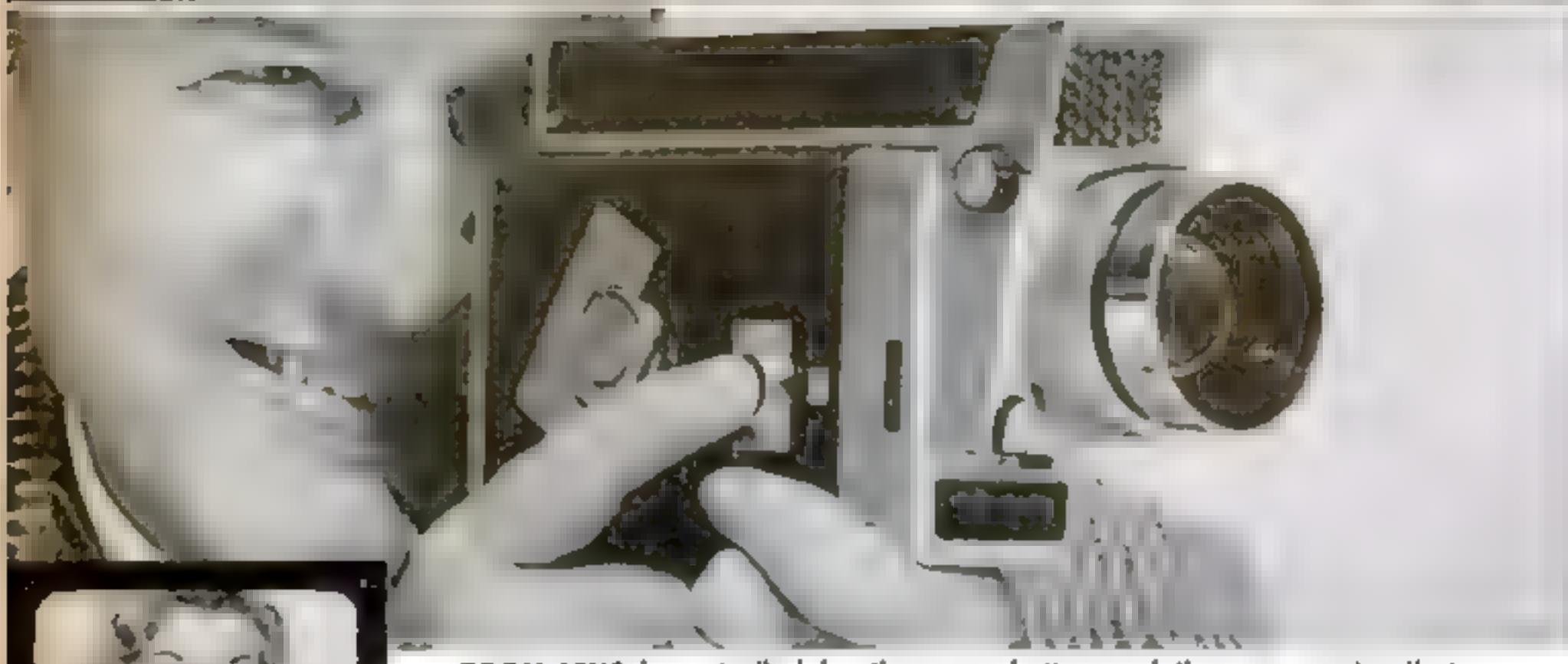
YES, I wish to join the brand-new Popular Science Living Library Program! Rush my first big shipment of Electrons Go to Work (free), Virus in the Cell (free), and my first selection, Our Astonishing Atmosphere. For this \$9.00 book shipment you will bill me only \$1.95 cost of the first selection alone, plus postage. Hereafter you will send me a new selection every three months and bill me for only \$1.95 plus postage. I may examine each book free and return it without obligation if I do not want it.

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New Ideas in Photography



ZOOM LENS is controlled by the same button and the same motor that operate the camera. Push up for wide-angle, down for telephoto—or stop anywhere between or zoom manually for special effects.

Dramatic movie zoom close-ups made easy by new Reflex Camera

Dramatic ultra-close zoom shots are easy with a Kodak Zoom 8 Reflex Camera—because you do your viewing right through the taking lens! There's no framing error—even at close range!

With this movie camera, you can show a face—then safely zoom in for expressive eyes . . . or for a youngster's missing front tooth . . . or for an identifying badge on a cap. You know the framing will be

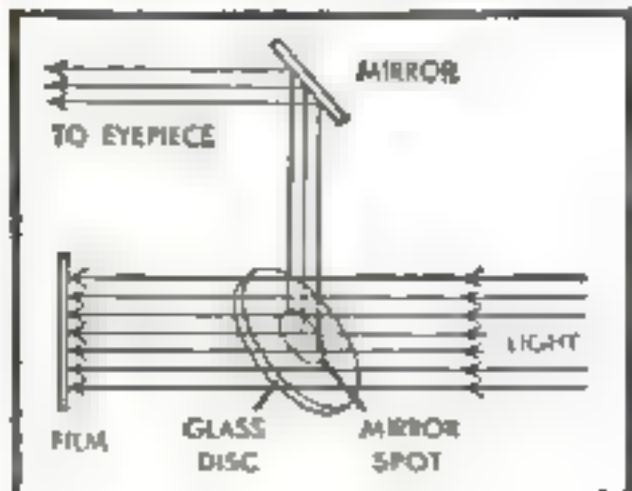
exactly right! You can picture a flower bed—then zoom in confidently for the center beauty. Or show a single bloom, then zoom in for the butterfly on it!

The camera's motor-driven lens lets you zoom in and out with professional smoothness. Electric eye adjusts exposure automatically. A meter lock lets you switch from automatic to manual exposure control whenever you choose.

Kodak Zoom 8 Reflex Camera is less than \$200. Other Kodak movie cameras from less than \$27.

◀ **STEAM-SPLITTER** lets you see in view-finder the exact picture going to the film. It is an angled glass disc with a small translucent mirror spot in the center. Part of the light hitting the spot is reflected to the eyepiece—to produce a sharp, clear image.

EXTREME CLOSE-UP MOVIE ZOOM is simple with Kodak Zoom 8 Reflex Camera. Through-the-lens viewing lets you compose your picture precisely. Low-cost Kodak Portra Lenses, attached to camera lens, let you come as close as 16 inches to your subject.



from Kodak

New automatic cameras solve old problems of outdoor action

Two Kodak automatic 35mm cameras are bringing new freedom to outdoor picture-taking—where action is fast and conditions change quickly.

The Kodak Motormatic 35 Camera and Kodak Retina Automatic III Camera not only set the exposure for you automatically—they also let you select fast shutter speeds to handle fast action. And the Motormatic 35 Camera even advances the film for you—keeps you always ready for the next shot!

Fast action is only one outdoor problem—when picturing sports or frolicking kids, for example. Variable light is another—as when clouds are passing across the sun. And going from sun into shade is a third.

Fast shutters . . . electric eyes

The Kodak Motormatic 35 and Retina Automatic III Cameras handle all these situations easily. On the Kodak Motormatic 35 Camera, you can set the shutter up to 1/250—on the Kodak Retina Automatic III Camera, all the way to 1/500 second.

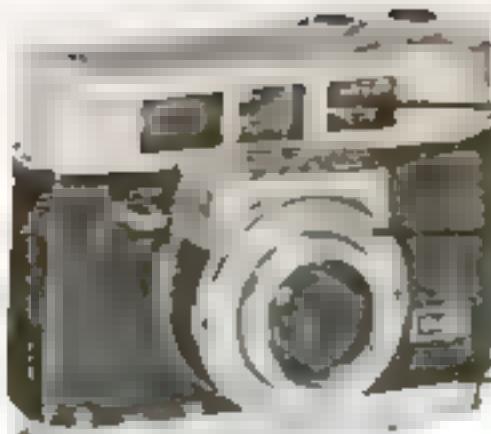
And each camera has an electric eye which reads the light continuously. When you press the shutter release, your lens instantly sets to the right opening.

Manual setting, too

If you wish, you can set either camera manually. The Kodak Retina Automatic III Camera also has a precision lens-coupled rangefinder for measuring distance. And the Kodak Motormatic 35 Camera has a special linkage for flash shots—as you change focus, the lens opening automatically adjusts for correct flash exposure.

Examine these remarkable ultra-modern cameras. One is just right for your kind of outdoor picture-taking.

See your dealer for exact retail prices. Many dealers offer terms as low as 10% down.



- Electric eye sets lens for you
- Flash link makes indoor shots easy
- Motor drive winds film automatically

KODAK MOTORMATIC 35 CAMERA can take 10 shots in 10 seconds! After each shot, a tiny spring motor swiftly advances the film, cocks the shutter. Fast f/2.8 lens. Fully automatic lens setting. Full manual control. With this camera, you can keep your eye glued on the action, ready for the best shots, no matter how fast they come. For flash pictures 5 to 25 feet from subject, setting focus automatically sets correct lens opening. Less than \$110.



- Electric eye sets lens for you
- Rangefinder for precise focusing
- Manual control for special uses

KODAK RETINA AUTOMATIC III CAMERA has superb Retina Xenar f/2.8 lens. Fully automatic exposure setting, with override for manual control. Fast single-stroke film wind. Coupled rangefinder. Depth-of-field scale. ASA film settings from 10 to 1250. Shutter release locks if light is too dim or too bright. Less than \$130.

Now—snap fast action in color!

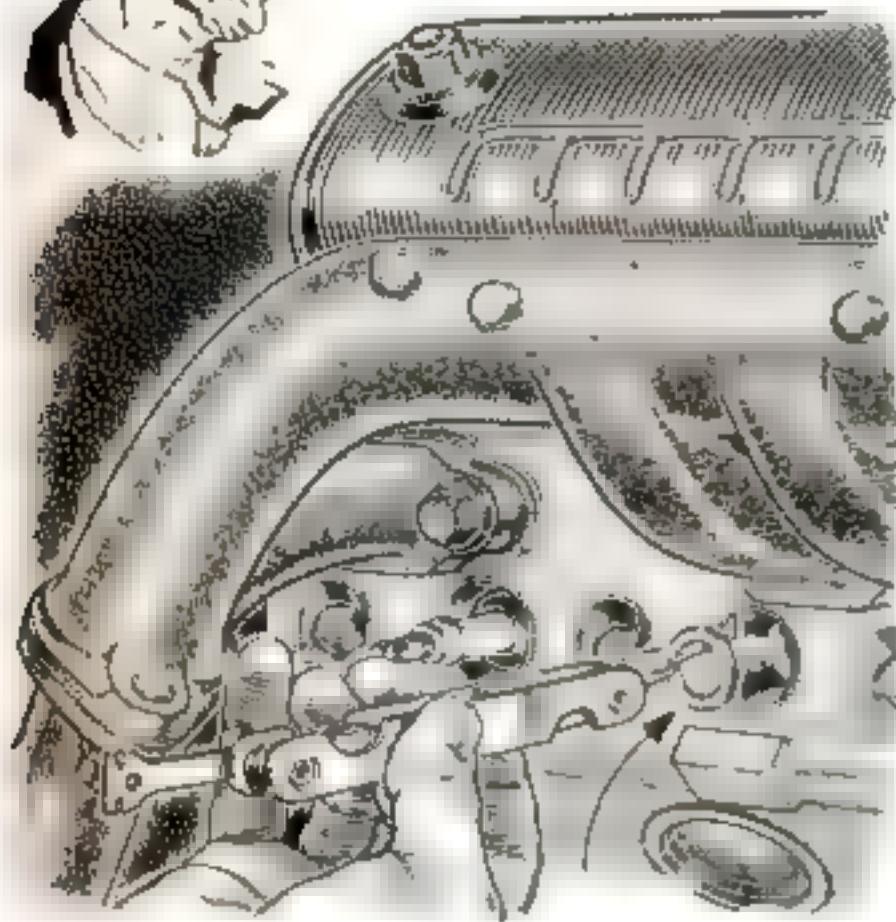
This weekend, start exploring the new picture possibilities opened by Kodak's ultra-fast 35 mm color film, *Kodak High-Speed Ektachrome*. With a sizzling daylight index of 160, it lets you take action shots in color that once were out of the question. Lets you get greater depth of field. Permits many indoor available-light shots with the camera handheld. Try it!

Prices subject to change without notice.

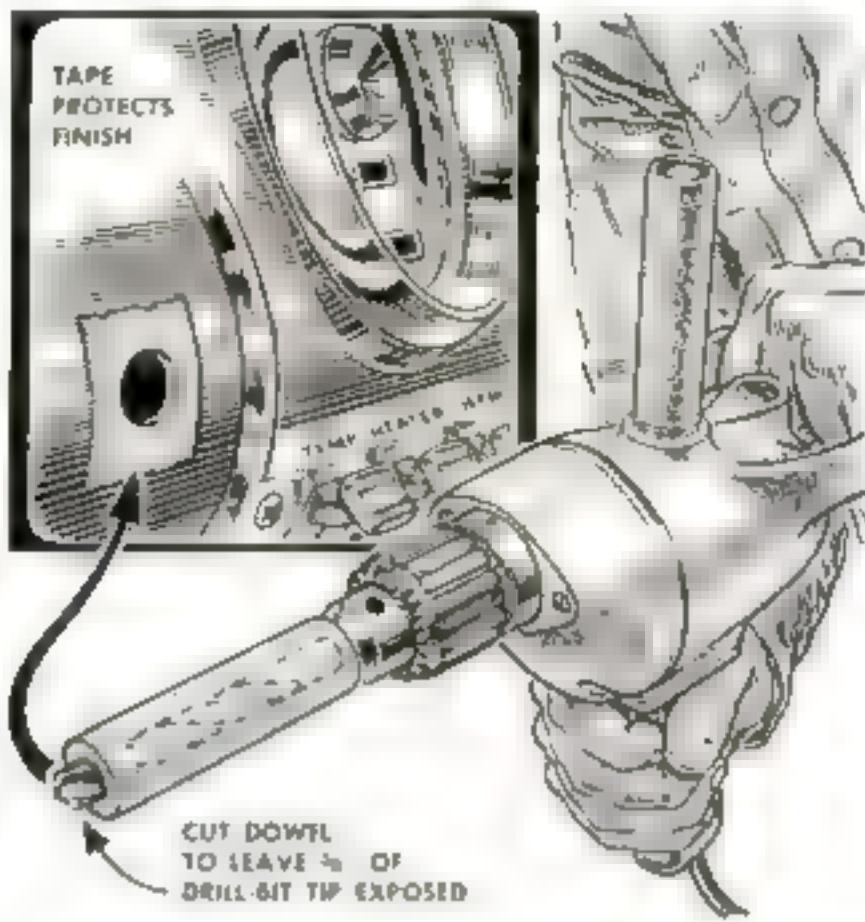
EASTMAN KODAK COMPANY, Rochester 4, N.Y.

KODAK
EASTMAN

Hints from the Model Garage



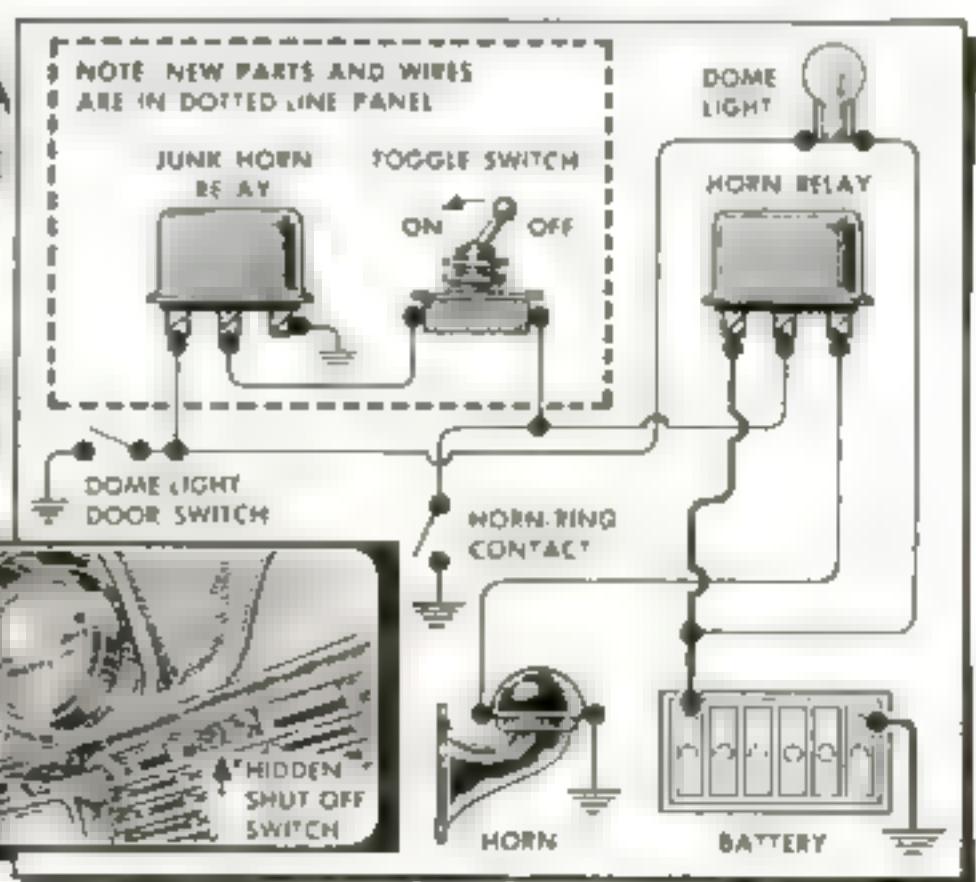
If a gasket sticks in the recess when you're removing spark plugs, fish it out safely and quickly with the hooked end of a wire-type gap gauge. Probing with the thin wire won't damage the threads or push dirt into the cylinder.



When making a hole in the dash or firewall, avoid the danger of drilling through into wiring or equipment by slipping a dowel over the drill bit to limit its penetration. Applying masking tape will keep the dowel end from chafing the finish.



A thief will take off fast the moment he opens the door of a car equipped with this burglar alarm. The horn is the alarm, and it blows loudly and steadily when an intruder actuates the dome-light switch by opening the door. Slamming

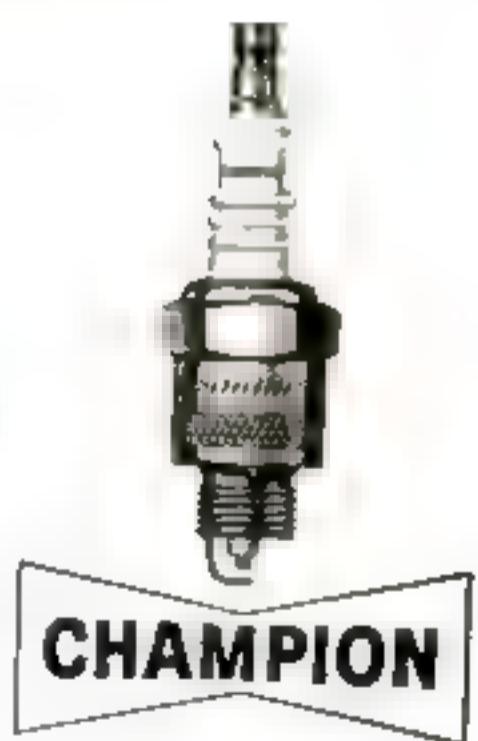


the door shut won't silence the alarm; there is a second horn relay, wired into the existing circuit as shown above, that keeps the horn blowing until you return and flip a shut-off switch concealed in a spot known only to you.

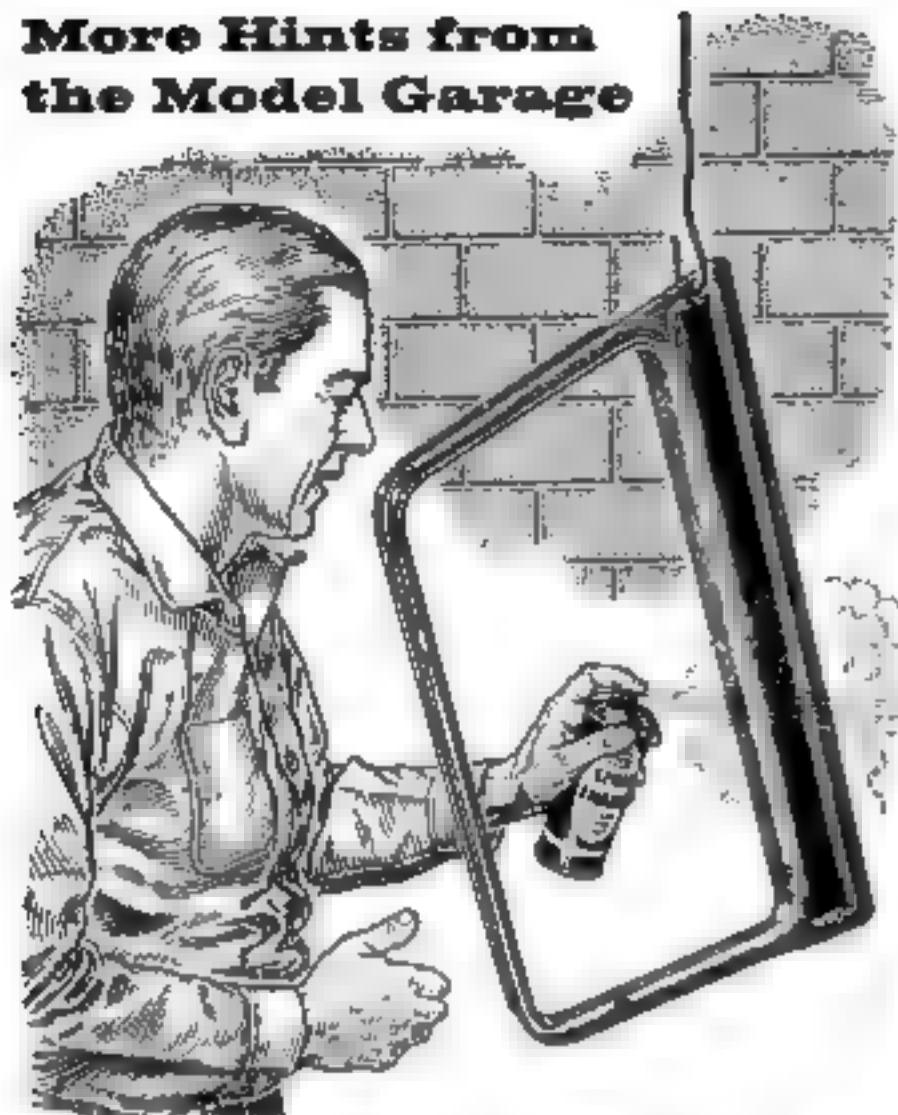


Jaguar's new XK-E convertible

Jaguar engineers specify
Champion spark plugs
because they demand the utmost
in quality and performance.
Why settle for less in your car?



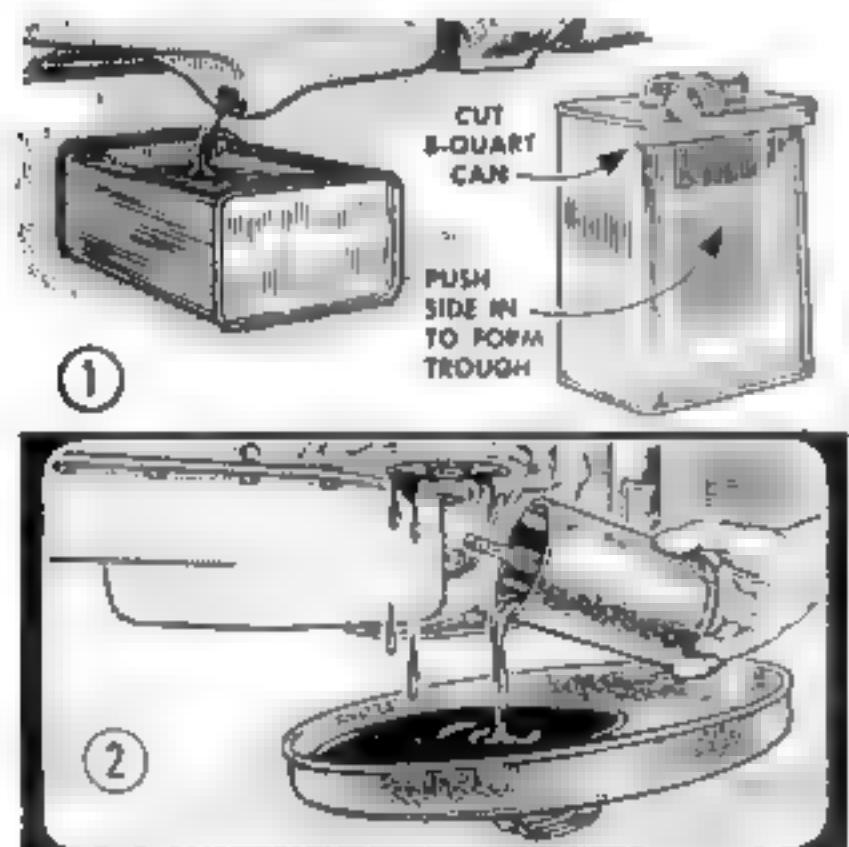
More Hints from the Model Garage



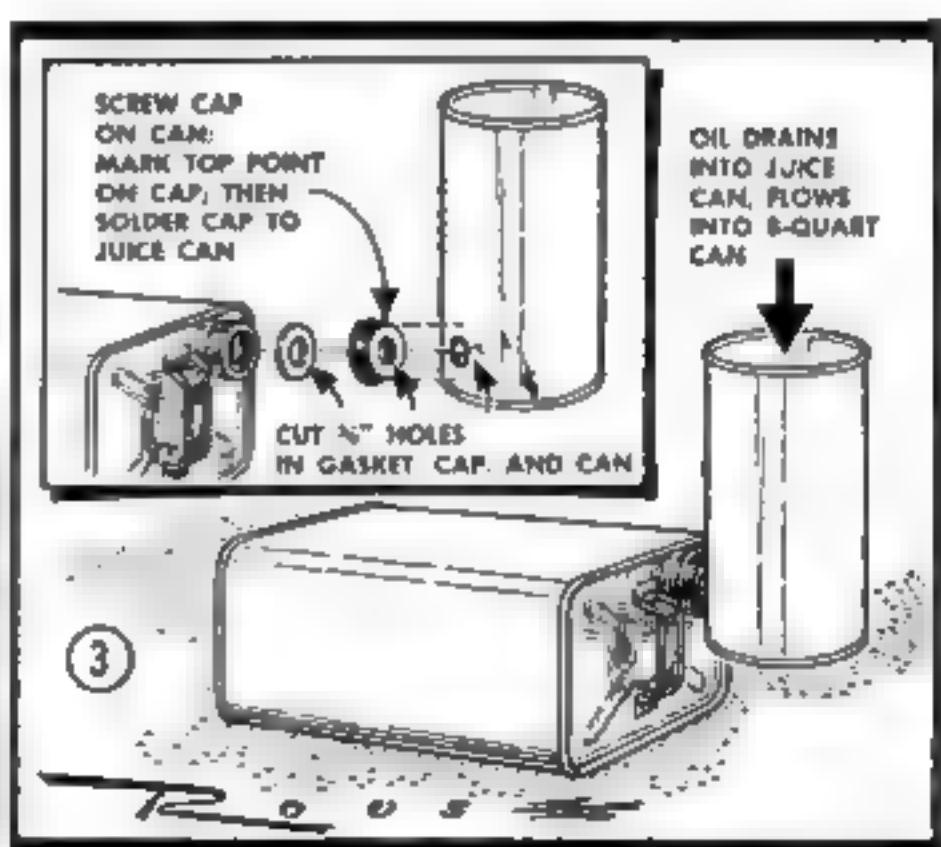
Interior of your car shabby? You can renew the appearance with little effort by painting the trim molding around the windows and windshield. These parts are easily removed. Sand them smooth and hang them on a wire for spray-painting.



Air leaks at the rim seal of tubeless tires can be detected without immersing the wheel in a tank of water. Just lay the wheel flat, pour water around the rim, and watch for bubbles. Repeat the test on the other side of the wheel.



Tips on draining oil: (1) Slit an eight-quart can near the top and press the side in. Oil will run down the trough and into the can, where it is retained when the can is picked up. (2) Use the lid from a garbage can to catch scat-



tered drips when removing the oil filter. (3) Solder a quart juice can to the cap of an eight-quart can and join them. The tall juice can will catch oil as it runs out of the crankcase. The oil will flow through the cap's hole to the large can.



This car needs Load-Levelers. Does yours?

Does your car sway dangerously around curves? Does it "bottom" on the frame when you hit a bump or rut? Does "tail drag" cause your rear bumper or tailpipe to scrape on driveways? Your car needs Super Load-Leveler® stabilizing units to compensate for the added weight of passengers and luggage, to keep your car riding its level best under all road and load conditions. And, in keeping your car level, they hold your headlight beams on the road, out of the eyes of oncoming motorists. Have a set of Super Load-Levelers installed today wherever you have your car serviced. Monroe's 60-day free ride plan guarantees you complete satisfaction.



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'Hold it'
bellowed Maloney
"You did two jobs
I didn't need"



Gus Makes a Fast Getaway

By Martin Bunn

OPEN to late-summer warmth, the doorway of Gus Wilson's Model Garage suddenly darkened with the bulk of an entering car.

"Come on out, Gus!" bellowed the driver. "No use sneaking under a car."

Gus came out of the office, grinning. "Our big-mouthed fire chief! Haven't been eating much smoke lately, have you Mal?"

Chief Maloney's seamed face puckered into a frown. "It has been kind of quiet. How'd you know?"

"Couldn't yell like that if you'd been earning your pay," cracked Gus.

"At least I don't diagnose auto jobs wrong and make people pay for my bum guesses!" roared Maloney.

"So what can I soak you for?"

"Got a noise. Boys at the firehouse say it's a bad water pump. Listen!"

Gus cocked an ear over Maloney's five-year-old sedan. It idled with a regular, metallic twang.

Stan, Gus's young helper ambled over. "Pump bearing's shot," he said.

Maloney cut the engine. "Good thing you've got a real mechanic, Gus," he roared. "Or you'd be charging me for something else. Have it tomorrow, huh?" He started out, but swung back. "Give my best to Nora Blythe, Gus."

Gus started. "Nora Bly—you mean Mrs. Simpson?"

"She's a rich widow now, back from Florida to settle her husband's estate," said Maloney with a wolfish grin. "I've sort of fixed it for her to see you."

"Now hold on—" began Gus.

"Didn't take much fixing," was the Chief's parting shot. "She's willing."

AN HOUR later, Gus got his hat. "I'm going upstate to see Tom Powers about overhauling his truck."

"But he said there's no rush," protested Stan. "I've got that brake job, and you promised to put that new radiator in Bronson's car today."

"You handle 'em," said Gus with uncharacteristic brusqueness. "I'll be—"

A horn blast interrupted him. From a shiny convertible, a mature, youthfully dressed woman with red hair called, "Gus! Gus Wilson!"

Hastily Gus walked over to the car.

RAY BUNN

"It's wonderful to see you again," said Nora Simpson warmly. "I've thought of you so often. I really have."

"Been a long time," said Gus.

"And you've never married! Naughty you," she cooed. "Look what Chief Maloney left on my car yesterday."

A slip headed "Fire Department" stated that the car had been found leaking gasoline in the street, and that excess gas had been drained from the tank as a safety measure. A suggestion that any necessary gas-tank repairs be made immediately was underlined. The slip was signed by Malcolm Maloney.

Equally annoyed and amused, Gus told Stan to put the car on a lift.

"Mal's very conscientious," Gus said to Mrs. Simpson. "But I think we can have you out of here very quickly."

The handsome red-haired woman pursed her lips prettily. "Are you in a hurry to get rid of little me?"

"No, no, of course not," fumbled Gus. "But I thought you might be—"

"I have oodles of time until I have to sign things at my lawyer's."

"Yes, ma'am," said Gus miserably, and took refuge under the raised car. "There's not a thing wrong with your gas tank," he reported presently.

"But it was leaking gas!"

"Somebody overfilled it with cool gasoline from an underground tank. It was a hot day. With the car in the sun, that tankful expanded. Some had to get out, so it spilled over."

"That's all that was wrong?" asked Nora Simpson.

"That's all," said Gus firmly. Motioning Stan away, he escaped further talk

by lowering and turning the car around to get Mrs. Simpson on her way.

SURPRISING Stan, Gus now forgot all about going to the Powers farm. Instead, he tackled the radiator job. And the convertible rolled back in.

"I forgot," said Nora Simpson triumphantly. "My no-charge light is on."

Silently Gus peered at the dash. The charging indicator stayed lit even when she revved up the engine.

"Tiresome," she pouted. "I had a new generator put in on the way up here because that light stayed on."

"Could be your voltage regulator," said Gus. "Or something even simpler."

"Well, do put in a new voltage thing, Gus."

"Could be just a loose wire."

"No, the other man said it might be that voltage thing, too. I want a new one. Then it's sure to be all right."

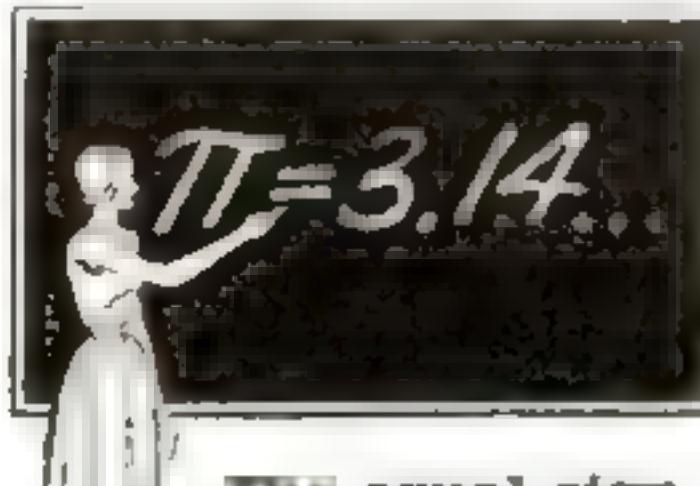
"Yes, ma'am," said Gus dubiously as, with a flirt of a bracelet-wrist, Nora Simpson tripped out of the shop. With some misgivings, Gus ordered Stan to install a new voltage regulator.

"That car has a printed instrument circuit," Stan reported later. "With a fuse in it. I checked that, too. Everything works, so she shouldn't be coming back again."

Gus looked at him narrowly. "Okay. You finish the radiator job, because now I am going up to Tom Powers' place."

RELEIVED to see the convertible gone next morning, Gus set to work on the Maloney sedan. He removed the belt that drove the water pump. Then, just to

Where'd it come from?



the equal sign

Good mathematicians as they were, the Hindus by the 11th century had a sophisticated symbol for equality, three dashes.

But the Arabs, responsible for spreading much Indian learning through Europe, in this case went back to more literal expressions. As late as the beginning of the 16th century, if you wanted to say two things were equal, you spelled it out: "sara egale." But by mid-century an Englishman, Recorde, had come along to father the modern sign. In his *Whetstone of Wit* issued in 1557, he selected the double dash = because "no 2 thyngs can be moare equalle."

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8 NEW EXCITING MODELS

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ESTABLISHED 1903

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A FEW
TRAFFIC
AND HAVING
MONEY TOO
WITH THIS
ALL NEW
BO MFG.
PACERS!

TALK ABOUT A HOT CYCLE
THE NEW **SPORTSTER 'N'**
HAS EVERYTHING IT HAD
AND MORE, RIDING THRILLS

COME RIGHT IN FOLKS
WE'VE GOT MORE NEW
MODELS FOR 1962 THAN
WE'VE EVER OFFERED!

TRY ONE OF THE
NEW **SPRINT**
DIFFERENTIALLY
GEARED
SPECIAL
SUSPENSION
AND IN PRICE
RIGHT
FOR ME!

BORN TO
THE LIGHT
IN BLAZING
NEW HARNESS
WITH THE NEW
RANGER
MODEL

GO ON OUT
LEAVE EM IN
THE DUST WHILST
IN THE NEW
SPORTSTER
'N'
OFF THE ROAD!

JUST RIGHT
FOR
SCRAMBLES

IN ANY POSITION
AND YOU'LL
BE ON THAT
SCAT'SAUCE!

DAD YOUR TOPPER 'N'
IS AN EXTRA SET OF
WHEELS THE WHOLE
FAMILY CAN USE!

THAT GOES
FOR BOTH OF US!

HONEY HOW ABOUT A
DELUXE DUO-GLIDE
FOR OUR NEXT
VACATION TOUR?

MAN WHEN THEY
SAY IT, THEY
MEAN SCAT!

HARLEY-DAVIDSON
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Send me the new literature on the 1962 Harley-Davidson motorcycle and motor scooter line.

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The scene? Your Harley-Davidson dealer. Stop in now for a look at the all-new line of Harley-Davidson motorcycles and motor scooters for '62. Take a test ride, too.

check the diagnosis, he started the engine.

The tinny clank was still there.

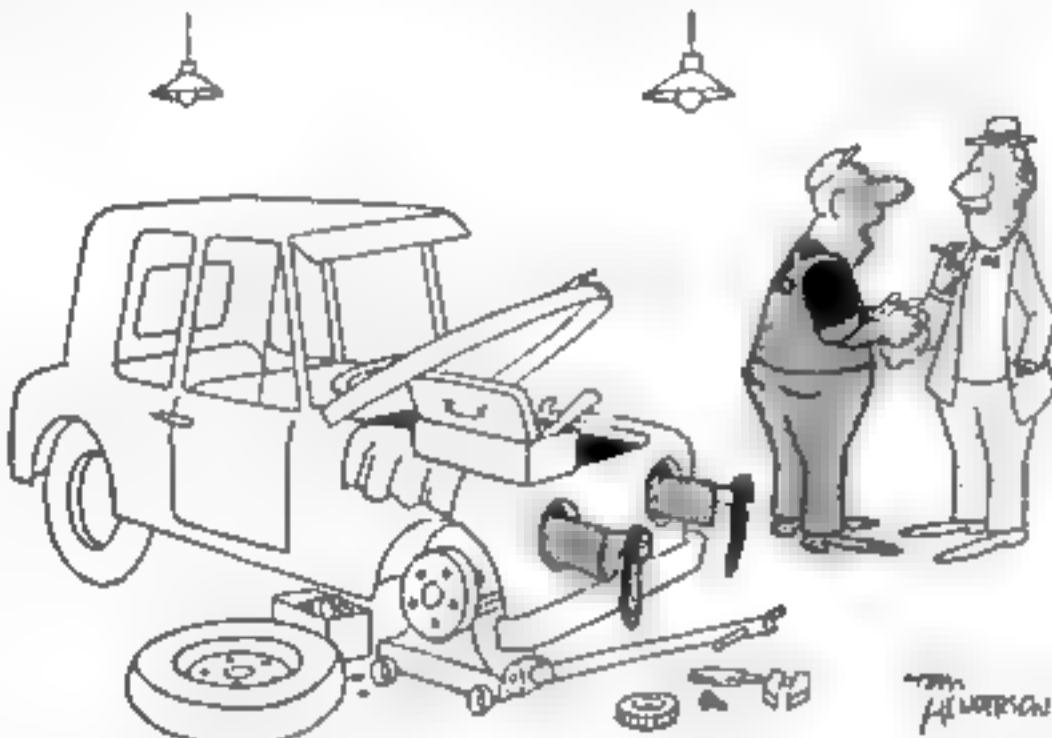
"Sure sounded like a pump bearing," remarked Stan, a bit crestfallen.

"Sure did," agreed Gus, leaning close to the left-hand cylinder bank. "It also sounds like a broken valve spring in number one cylinder. Let's—"

A familiar horn interrupted him.

"I hate to bother you," called a smiling Nora, "but it's lighting up again."

The charge indicator was mockingly alight. In grim silence, Gus put a meter on the generator. It was charging. The regulator, too, worked perfectly. Along-



"We're still trying to locate the trouble, Mr. Everett."

side him, Nora chattered on amiably.

"You look so well, despite the awful winters you have here. You should move to Florida—such good fishing and—"

Gus ducked under the instrument panel. If the fuse were blown, the indicator would "fail safe" by lighting. He shorted the fuse clips with the engine running. The light went out.

He removed the fuse. It wasn't blown, but the light he turned on the clips showed green corrosion. By handling the fuse, Stan had restored contact until, overnight, creeping corrosion had again interrupted it. Gus stopped the engine, cleaned the clips, put back the fuse.

"Do you keep this car near the shore much?" Gus asked as he got out.

"A great deal. We have a seashore cottage. I'd just love to show you."

"That's your trouble, Nora."

The curved lips set angrily.

"I mean that sea air at the shore,"

Gus explained hastily. "Salt-water corrosion caused a bad contact. You didn't need a new generator or regulator."

"Oh, well," she said mollified. "But I do wish you'd visit Florida."

"My sinuses can't stand sea air," lied Gus. "Now Mal, he just loves it. Always wanted to fish for tarpon, too."

Almost absent-mindedly Nora Simpson started the engine. The indicator winked out. Thoughtfully she drove away.

"WHERE'S the ham-handed boss?" "Over here," retorted Gus. "Trying to figure how to get even with you."

Maloney guffawed. "It wasn't all a gag. Her car was spilling gas, Gus."

Gus grunted. "Keep laughing—I've got bad news. We put a new pump in your car, but the noise stayed. Thought it was a busted valve spring then. But after we pulled the head, we found them all okay—"

"Ho-o-ld it!" bellowed Maloney. "You did two jobs I didn't need?"

"Tough break," said Gus, starting the engine. Under its smooth idle was the metallic twang. Maloney turned brick red.

"Notice how awkward it is to pull the dipstick out? It's under the generator. The double pulley makes it harder."

Grasping the dipstick, Gus yanked. It came out—and the noise stopped.

"You almost have to bend the stick to put it back," explained Gus. "And some serviceman did. See how shiny the bent part is? It's been hitting the first crank throw. Easy enough to straighten. I won't even charge you—for that."

"But you'll soak me for a new pump and for pulling the head!" sputtered Mal "Why didn't you find this first?"

"Relax. I did," admitted Gus with a wicked grin. "The dipstick's in front of number-one cylinder, where the noise came from. So I checked. Are we even?"

"Cagey, aren't you?" rumbled the chief. "That how you stayed single with a gal like Nora Blythe chasing you?"

"No," said Gus. "It was by running a bit faster than Ed Simpson." ■ ■

Why a good tune-up includes Spark Plugs

Some people do engine "tune-ups" and never look at the spark plugs; others service or replace spark plugs, and that's all. Either of these operations can give a temporary lift to engine performance—but it's only temporary, you can be sure. A good tune-up *starts* with spark plugs, then checks all the things that affect their operation—compression, battery, coil,

distributor, timing and carburetor. In a good tune-up, the prime concern is the proper functioning of the spark plugs, for only when spark plugs are right and everything that works with them is right, is your engine conditioned for long-lasting top performance. So, for the very best results, make sure your spark plugs are checked when your engine is tuned.

Why the best tune-up includes AC Fire-Ring Spark Plugs

Your engine will perform better—longer—if the tune-up it gets includes new AC Fire-Ring Spark Plugs. AC Fire-Rings have a host of superior performance and reliability features. ACs give you the exclusive Hot Tip that provides self-cleaning action as you drive. ACs are built with heat-bonded internal seals and pressure-

formed external seals for positive prevention of gas leakage, overheating and pre-ignition. ACs have exclusive Buttress Top insulator for greater strength and better wet-weather firing. In every area, ACs offer the most advanced design. For the best tune-up, make sure your spark plugs are ACs.

AC SPARK PLUGS • THE ELECTRONICS DIVISION OF GENERAL MOTORS

**AC FIRE-RING
SPARK PLUGS**



BUILT BEST FOR EVERYTHING YOU OWN THAT RUNS ON GASOLINE

Most of all, why do we continue to tolerate those chromium-plated stilettos so malevolently aimed at heart, brain, and legs? There are trim screws and ashtray knobs that pierce skulls, ignition keys and parking brakes that shatter kneecaps, dash panels that hit knees to break hips. Deadliest, perhaps, is what safety experts refer to among themselves as the "cookie-cutter horn button." This is a sharp ring of chrome that for several years has been fitted to the center of some dished wheels. In a moderate collision the wheel spokes bend down and the cookie cutter punches right through the breastbone to the heart. A driver who could have come out with broken ribs ends up dead.

The needless tragedy caused by such designs was vividly illustrated by Dr. William Haddon of the New York State Department of Health. He told the Society of Automotive Engineers:

"I chanced to be first to arrive at a head-on collision at low speed between late-model cars. A practical nurse who had been driving was thrown across on a small screw projecting only an eighth of an inch from the sun-visor bracket. She left a piece of her scalp and her gray hair on it as it ripped her scalp in the fashion of an Indian almost from her hairline to the back of her head."

Then Dr. Haddon quietly added: "I think it is reasonable to say that someone placed that screw there by design."

The known hazards

Much can also be done to prevent accidents.

You can't always see the road clearly. Not all cars have windshield washers. Some wipers are sloppy.

Multiple mirrors or periscopes are essential. Today's inside rear-view mirror helps your wife get her lipstick on straight, but not much else. And the outside mirror—without which no savvy trucker or bus driver would even start his engine—is an optional extra on most passenger cars.

These things are simple and fairly cheap. The need for them is obvious. A smart 15-year-old boy could look around a modern car and tell you how to make it safer. But if common sense isn't

enough, the research reports overflow the files.

A deadpan statement from the staid Liberty Mutual Insurance Co. is illuminating. In a pamphlet describing the company's modification of a '60 stock sedan into "Survival Car II" appears this offhand remark: "The immediate problem was to redesign the known hazards out of the car."

Why don't they make cars safe?

The answer is disturbing: Nobody forces anybody to do it. Worse, all kinds of pressures from many sources work against it.

Detroit bears the brunt of the blame, more than is warranted. Its view was put by L. H. Nagler, staff safety engineer for American Motors, who said recently:

"The automobile industry has promptly adopted safety equipment and designs proved to have definite safety values, where economics and public acceptance have not been seriously adverse . . ."

It's that last clause that kills you. Economics are almost always adverse. Safety devices cost money; they raise the price of cars at least a little—and in an intensely competitive business that endangers sales. Detroit is also convinced that "public acceptance" is usually adverse, that a safety pitch scares customers away. Ford still bears scars from 1956, when it sold much safety and fewer cars.

Yet the industry cannot shuck all responsibility. Those lethal skull-crackers and eye-gougers sprinkled over doors and dash panels could be eliminated at no cost in money or public acceptance. They have not been.

You can't expect Detroit to move on safety without sharp prodding. The case of the seat-belt anchorages—those four holes in the floor—is an example.

Detroit nurtures the impression that these four free holes are being provided voluntarily out of the goodness of the industry's heart, an agreeable marriage of commerce and public interest. Actually, it was a shotgun wedding.

The man with the shotgun was a tough and savvy lawyer-politician from Mineola, Long Island: New York State Senator Edward J. Speno, chairman of

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free at your lumber dealer's*

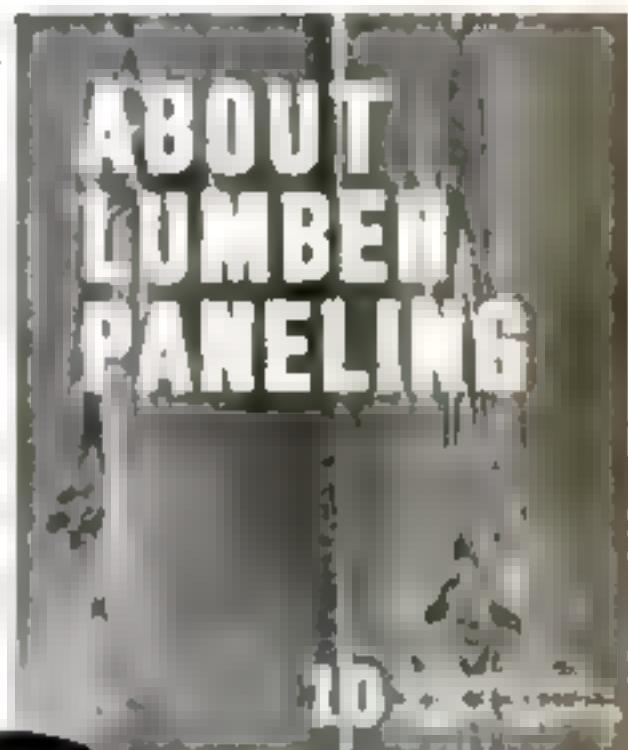
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Why They Don't Make Cars Safe

the legislature's committee on motor vehicles. Speno proposed a law requiring anchorages on all new cars licensed in New York. That was nothing. Similar bills pop up and wither all the time.

What rocked Detroit was the discovery that Speno had the determination *and the votes* to pass his law. Faced with the inevitable, Detroit agreed "voluntarily."

It took the power of a state legislature to force a change for safety—and a very minor change at that.

And the power of the public?

Couldn't ordinary car buyers force manufacturers to offer safe cars? They could, but they don't. Seat belts have been available since 1956, but fewer than two cars in 100 have them. Only about one in three car buyers coughs up \$20 for dash padding, although radios costing three times as much are bought by 90 percent.

It is unrealistic to expect the entire public to act like paragons of virtue—especially when it means facing facts and spending money.

Can't insurance companies put the squeeze on car buyers by offering cut rates for properly fitted cars? They do exactly this with factory owners. If the factory installs safer machines, the workmen's compensation insurance gets cheaper. If the factory tries to get away with an obvious hazard—like leaving shields off grinding wheels to speed production—the insurance may be canceled completely. The shop is shut down.

This simple economic pressure has made American factories into just about the safest places in the world. But such a squeeze play works only because the insurance companies take in premiums and pay out claims to the same group: the factory owner and his employees. A safer factory means fewer claims *from that factory*, and therefore cheaper rates *for that same factory*.

Car insurance is different. The company collects premiums from you, but usually pays damages to somebody else—somebody it doesn't know, driving a car it doesn't know. You could be driving the safest car possible. If you hit another guy, your safe car might protect you completely. Your insurance company might be happy for you, but it wouldn't save

much money; it has to pay the other guy. So how can it give you a cut rate for your safe car?

Then there ought to be a law

State laws have regulated automotive equipment for more than 60 years. But with rare exceptions (like Speno's seat-belt holes), the states never prod Detroit. They meekly follow Detroit's lead.

When auto makers wanted dual headlamps—a safety improvement that also carried styling advantages—the state administrators were brought in and sold the new idea. The laws regulating headlamps were then amended.

The state agencies do not have the money, the people, or even the clear authority to specify improved auto design. This may be a blessing. Chaos is in sight if headline-hungry politicos in 50 states, their appetites whetted by Speno's success, legislate their own pet safety gimmicks.

That leaves the Federal Government. It already regulates the design of every other vehicle—ship, train, and airplane. Why not cars, which are just as vital to interstate commerce? Only the Federal Government has the power and the facilities to do the job right.

It needs doing right, desperately. ■ ■

Fill 'er up!



An incongruous mixture of the old and the new took place when this mule-drawn wagon rolled into a Memphis service station to get some air in its pneumatic tires. Adjust the blinders, sir?

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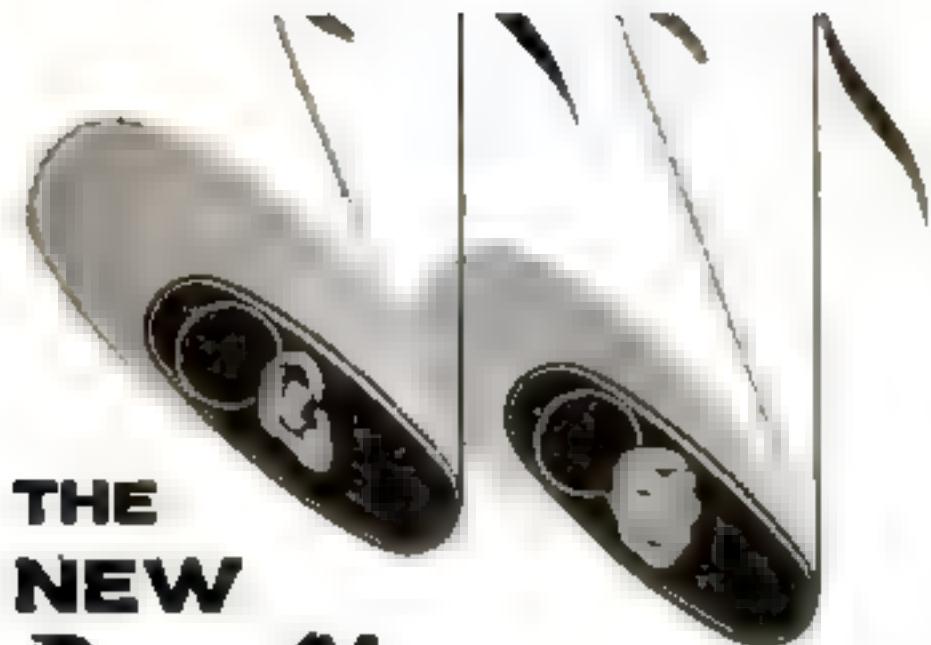
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Atomic Accident That Couldn't Happen [Continued from page 55]

Army men from Dugway Proving Grounds, Utah, got the last body down from the ceiling. A crane boom, poked through a cargo door, swung a net over the reactor lest any falling object jar it. Five teams of two men each, working in relays, lowered the body into the net and the crane backed out with it.

Concussion had killed these two crewmen instantly, medical examination showed.

All three, besides, were fatally exposed to radiation. As if from a shotgun, radioactive particles were driven into their bodies by the blast; the victims were so "hot" that it was 20 days before funerals could be held. They were buried in lead-lined vaults.

The investigation. A team of five investigators headed by Curtis A. Nelson, director of AEC's Division of Inspection, arrived shortly after the blast and began sifting clues. Photos of the scarred reactor room were soon in their hands. A cameraman in mask and coveralls, given 30 seconds for his task, took the first on January 5.

Clearly the reactor had exploded. Its metal cover was wrenched upward. Heavy fittings called shield plugs, closing the reactor ports, had been sent flying. Two were embedded in the ceiling.

But only over the reactor was a light bulb broken; others were still burning. A steam blast would hardly be so localized — straight up. Apparently water had been explosively hurled from the reactor.

Proof that the reactor ran away was announced on January 19. A brass screw of a crewman's cigarette lighter, AEC analysts found, contained copper 64. So did a brass watch-band buckle worn by another victim. In the third man's gold ring was gold 198. Only in one way could those telltale radioactive substances have been formed — by flying neutrons from a runaway chain reaction.

Would the reactor explode again? On Feb. 22, a camera on a crane boom got the first pictures of the reactor's wrecked interior. Observers with telescopes, atop a wooden tower 200 feet away, directed the crane man. But even a Navy photo interpreter could not tell from the pictures whether the reactor was safe.

Thus, entering the reactor room was

Atomic Accident That Couldn't Happen
forbidden, after recovery of the crewmen's bodies (which the first photos had helped to plan). For three months—until probes found the reactor empty of water and safe—new clues were hard to get.

So, for more light, the probes turned to delving into the two-year-old SL-1's past history. What they found was enough to make their hair stand on end.

The search into SL-1's past. Designer and builder of SL-1 was the famed Argonne National Laboratory, Tiffany of reactor makers. Much of its design was admirable. Some out-of-the-ordinary features proved otherwise.

Immersed in water, the core's fuel elements were shaped like square organ pipes, and contained uranium 235. The heat of its chain reaction boiled the water. The steam ran a 200-kw. turbo-generator, and warmed air for heating.

Five motor-driven cadmium control rods regulated this atomic boiler. Lowering them into the core stopped the heat-producing chain reaction; raising them started and accelerated it.

Since water had to surround the fuel for the chain reaction to occur, such a "water-boiler" reactor was supposed to be runaway-proof. Steam bubbles would push the water away from overheating fuel elements—and halt an out-of-control chain reaction. True, that could eject a geyser of hot water and steam, if the control rods were pulled out far and fast. But if SL-1's fuel elements went "pfft," safety valves could handle anything that happened—because its control rods' motor drives enforced safe limits on the rods' travel and speed.

But what would happen when the rods were not connected to their drives? Overlooking this eventuality was the flaw in the reasoning—because of a decidedly unusual feature of the SL-1's design:

An important clue. One control rod, the center one, was "strong" enough to start up the reactor all by itself. When this rod was disconnected and moved by hand, one man could undo all the runaway-proofing.

On Jan. 3, using a T-shaped handle, a crewman had to lift this 80-pound rod just high enough to reconnect it to its driving pinion. "Not more than 4 inches," said his instruction manual.

Raise it 16 inches, and the sleeping



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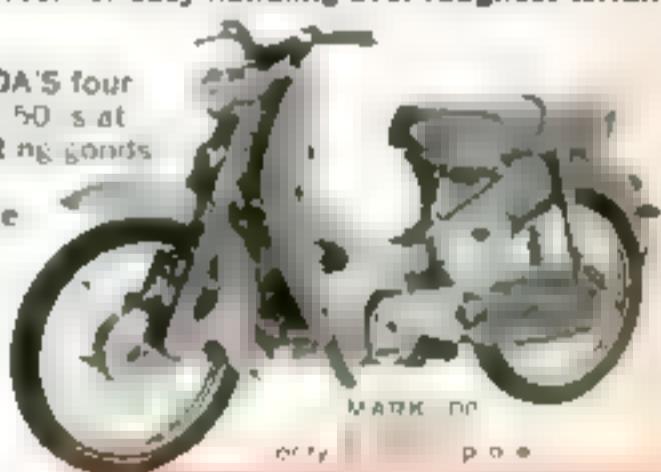
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Atomic Accident That Couldn't Happen
reactor would come to life; 22 inches, and the awakening could be violent. A simple safety stop could have guarded against that. The SL-1 had none.

A mock-up of the center rod was built. Trials proved a strong man could have yanked it high and fast enough to cause the runaway. The most likely scene at the moment of the accident, the A-detectives concluded, was this:

A crewman was lifting the center rod. Possibly another was helping him.

But pulling so hard could have been no careless slip. Why do it? The SL-1's Operating Log revealed a likely answer:

Sticking control rods had plagued the SL-1's crews—40 times in the last two months. Sometimes the binding of the rods in their close-fitting housings was so severe that a crewman with a pipe wrench had had to help the motor pull one out.

So this, said the sleuths, was their "suggested hypothesis" of what happened:

When the crewman tugged at the center rod, it balked. To free it, he gave a mighty heave. Like a stuck window coming unstuck, the rod suddenly shot upward—and the explosion followed.

Other things wrong. But control rods were not all that was out of order.

Another unusual SL-1 feature was this: To prolong the life of the core, it was crammed with a three-year supply (30 pounds) of enriched uranium. That was altogether too much for the control rods, unaided, to hold in check. So "poison" strips—so-called because they weakened the chain reaction—of aluminum-coated boron were tack-welded to the outside of the aluminum-clad fuel elements. As the uranium burned up, so would the boron. The idea was fine; the material, faulty.

The brittle strips warped, cracked, shed fragments. Bowing out, they jammed fuel elements—and must have squeezed the control rods' housings, too, which may have caused the sticking. In pulling out fuel elements forcibly for inspection, their poison strips were shattered, some ripped off.

Ominously sinking control-rod settings warned that SL-1's margin of safety was dwindling. To replace the decrepit core, a new one of different design and make was ordered, for spring of 1961—just a

Atomic Accident That Couldn't Happen
few months too late, as it turned out.

The "distance to death." No one knows how much boron the SL-1 shed during its last shutdown, from Dec. 23 to Jan. 3. The estimate that the center control rod had to be lifted 22 inches to cause a runaway was based on control-rod settings when the reactor was last running. If much boron fell off after that, the "distance to death" could have been even less—somewhere between 4 and 22 inches.

That would have made it easier for the accident to happen—with or without the complication of a sticking control rod.

Which of SL-1's faults contributed most to the accident may never be known—but the mystery of what could have caused it was solved. What probably happened was vividly pictured.

Who were to blame? Many, said the report of the Nelson board of probbers:

The designer: For failing to provide a safety stop, or test the boron strips adequately ("probably not defensible").

The operator: A "prudent" one would have shut down the SL-1 as unsafe. (It should have, CE agreed.) That was the major one of a number of misjudgments.

The AEC, too (said its own probbers): Why did it let the SL-1 go on running? Astonishingly, its Washington headquarters was unaware of how serious the SL-1's defects were; even its Idaho office was poorly informed. Liaison had been faulty among the groups at NRTS, and between Idaho and Washington.

Horrified by the SL-1's blot on its outstanding safety record, the AEC set in motion a huge-scale safety survey of all reactors. Just one other was found, a military one in Greenland, that could be started with a single control rod; at once a safety stop was installed. While all was well with the rest, safety and reporting procedures got tightened up.

Lastly, the AEC will disassemble the wrecked SL-1 for any further clues. That may take well into 1962. Radioactivity, though down to 100 r's an hour by last June, will be too high for months to work there. Probably remote-control mechanical arms must do the job. Experts doubt much more will be learned—but the accident's victims will not have died in vain, for lack of any possible effort to profit by its lessons.

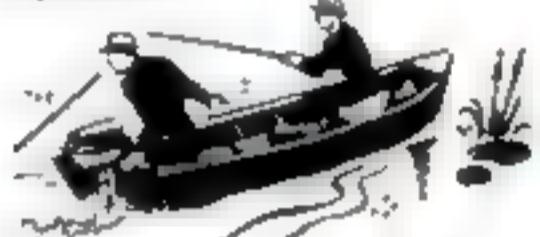
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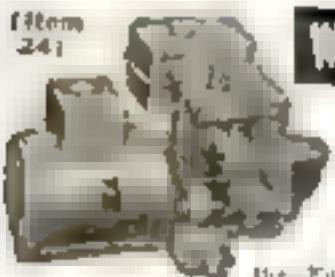
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The Car You Can't Grease

[Continued from page 59]

they wanted an unusually rugged vehicle that could go off the highways and operate on rough terrain.

Both goals seem to have been attained. For the better part of a day this summer, I sat behind the wheel of a production model over some 150 miles of flat land and winding mountain roads in the Camargue and Herault regions of southern France. I drove the car hard. Gas consumption was a conservative 35 m.p.g. The car handled nicely. The ride was comfortable. And I wound up the day wishing I could buy one at home.

Trouble is, Renault has no present plans to bring the car to the U.S. Probably later, they say. But everything's very indefinite. If and when they do bring it, what will it sell for? Around \$1,200 perhaps. And that, I'm here to tell you, would make it fine, bargain transportation for anyone.

An extra door in back. The car comes in two models: the R4 and the R4L. Both are the same size—four-seaters with four doors hinged at the front and a rear door that swings up high to give ready access to a spacious luggage area behind the rear seat. The R4L has more refinements. You note the difference immediately. At the rear corners, where the R4 has metal panels, the R4L has glass, giving it three windows on each side.

The all-season coolant in the sealed system is a special mixture developed by Renault, based on a glycol-type antifreeze. It protects to minus 33 degrees.

Prototype sealed systems have been operated by Renault in the extreme cold of northern Minnesota and in the blazing 125-degree temperatures of the Sahara Desert. Testing has been in progress for three years. How much longer beyond this might you expect the sealed system to remain troublefree? Renault confidently predicts that the cooling system should last, unopened, for the car's life.

An expansion tank, located under the right front fender, saves the coolant when the engine heats up and the liquid expands. As pressure builds up in the radiator, liquid is forced through a rubber hose into the tank. When the engine cools, coolant returns to the radiator.

It's maintenance-free—almost. The no-greasing and sealed-cooling features

The Car You Can't Grease

were introduced for a sound reason. With an eye on world markets, Renault's objective is a vehicle that will keep running, even under conditions of neglect, in areas where roads are poor or there are none at all.

There's no place at all for a grease gun. You are advised to change the engine oil every 3,000 miles and the transmission oil every 6,000. But beyond that you have either rubber bushings for moving parts or permanently greased and sealed joints.

On my test trip, as I neared my luncheon rendezvous with some Renault men, I saw ahead what appeared to be a road block. And it was—a group of Renault officials who waved me off the road.

"Just follow the arrows," they said. I looked where they pointed—to a twisted landscape of ravines and hills, strewn with rocks. It wasn't a place where I'd choose to drive my own car. But a sentence I'd read in the Renault announcement came back to me:

"The exceptional ground clearance of 7.9 inches and the perfectly flat underside allow the R4 and R4L to travel over the worst possible terrain, even over rough ground that only specially designed vehicles would normally tackle."

Tire trouble. Ahead of me was the chance to prove out this claim on the devil's very own torture course. "A jeep would have real trouble on that one," another American visitor remarked as I successfully completed the circuit. I was inclined to agree. Later in the day, several tires went flat (presumably from rock bruises) on other cars that went over the route. A decision was made to fit heavier tires on later models.

This experience convinced me that in the far reaches of our own West you could use this car nicely as a camper. Leave the rear seat at home (both bench seats are readily removable) and you have plenty of space for hauling your outdoor equipment. In fact, if you installed a leveling framework of plywood in the depression where the rear seat rests, you'd have a level area for two sleeping bags.

With a setup like this, you could go just about anywhere. No need to think about roads. For this new Renault is a car that doesn't *need* a road. ■ ■



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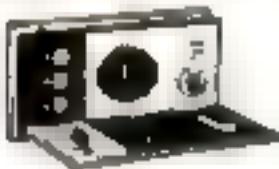
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Answers to PS Puzzlers

on 24 and 26

Gravity. As long as they are held in the hand, the balls experience the same accelerated motion as the person holding them and the ship itself. But when they are released, they are no longer so driven, but start to move with a velocity equal to the ship's at the moment of release.

They are then, à la Galileo's experiment, moving side by side. The ship itself, however, is continuing to gain speed, and the "floor" (the part opposite to the direction of motion) will quickly overtake the balls and hit them simultaneously. The person on board the spaceship will see the balls "drop" and hit the floor; the person outside will see the floor rise and meet them.

Ten coins. The general solution to the 10-coin puzzle—when restricted to the rule that the rows of five were at top and bottom of the paper—boils down to the form at right:



But this form is capable of many distortions—all of which involve selecting three coins from one row and one coin from the other. The possible combinations for choosing the four coins in this way total 100, and if we consider each permutation of the four selected as a particular solution, there would be 24 such permutations for each selection, or 2,400 solutions all together.

Number quickies:

$$[(8+8) \times 8 - (8+8+8)/8] \times 8 = 1,000$$

Make six strokes at equal distances apart:



Now add five more strokes in appropriate places and behold.

NINE

Fare. Smith should pay \$2.50. He traveled half the total distance with Jones and so owes half of that cost.

Picnic. Let n = the number of wagons, p = the number of persons per wagon at the start. Then the total, np , can be figured in two ways:

$$np = (n-10)(p+1) \text{ and also}$$
$$np = (n-25)(p+3), \text{ yielding:}$$

$$n-10p = 10$$

$$3n-25p = 75$$

Multiplying the top equation by 3 and then subtracting, you get

$$-5p = -45$$
$$p = 9$$

which, on substituting, makes $n = 100$.

It was a big company—900 people went on the picnic.

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Why Inventing Is a One-Man Job

[Continued from page 22]

ation, I reached the limit of my patience with an engineer whose arrival in the morning must have been timed by a sun dial in cloudy weather.

Sometimes he arrived at 10 and sometimes at noon. He was as bright as any engineer we had, and often he worked late into the night. But his unreliability was just too much.

Three years after I fired him, he had made several million dollars from one of his inventions.

Personnel-testing schemes are now arranged to screen out such men. Not every inventor, of course, insists on dressing like a Californian. But there are enough pressures and problems in a big factory without adding the disturbing nature of the oddballs' creative contributions.

It is necessary to distinguish between some of these facts of business life and the public-relations utterances about our zeal for progress. Because of these statements, I think many commentators have been misled. The fact is that there are important pressures against innovation and that they are highly concentrated in any hard-working productive enterprise. I mean no disrespect to General Electric, which, in fact, has done a good job in creativity, when I say that in many firms "Progress is our most important slogan" —and little more.

Finally, I venture the suggestion that our big corporations don't really need to innovate. When they do, they take risks which they can avoid by depending less upon creativity and more upon size, momentum, organization, skill, and advertising.

We come now to the third and last basic reason why I believe our big corporations will not come to dominate creativity as they dominate the market place. That lies in "accident." Invention defies planning. It is simply not possible to corral into industrial research laboratories any but a small fraction of the men who contribute the significant ideas.

I refer to two kinds of accident. The first is the legendary accidental invention —like Dr. Fleming's observation of an unusual mold in a culture plate that turned out to be penicillin.

The other kind of accident is in the nature of the nonprofessional inventor.

Why Inventing Is a One-Man Job

As observed by Jewkes, Sawers, and Stillerman in *The Sources of Invention*, George Eastman of Kodak was trained as a bookkeeper, not as a technician; Midgely was a mechanical engineer, not a chemist; the men who invented color film were not chemists but musicians; the inventor of the ball-point pen had been at various times a painter, sculptor, and journalist; Dunlop was a veterinarian; and the inventor of the dial telephone was an undertaker.

If the director of a modern research laboratory had hired this motley crew to work on the kinds of things they invented, he would have been fired.

IT IS important that our big businesses welcome new ideas. I find much of American business far less receptive to new ideas than the businesses of Europe. So long as our conservatism is confined to our business organizations, I do not fear any desiccation of the wellspring of creativity from individuals. The danger lies in this: that the organizers, who in business keep the innovators in their place, may extend their dominion to society at large. This could lead to economic stagnation and, more important, to the atrophy of the creative spirit.

If big business comes to want new ideas, it can help itself by improving the climate for their growth within business. It can help itself much more by opening its doors to creative individuals outside the walls.

As a lawyer, I have written some of the documents that inventors are required to sign before their inventions will be considered. I know something about the kind of reception that inventors usually receive.

I think that our corporations are lawyer-ridden. There is far more concern to avoid a possible lawsuit than there is to get hold of a new idea. This, I think, has to change.

Beyond this, I would urge the manager of any business who is really interested in new ideas to get a new crew of people to interview inventors. He should also set aside an amount of money that he fully expects to lose. If a man is never explaining his failures because he has only successes, it means simply that he is not taking enough risk. ■ ■

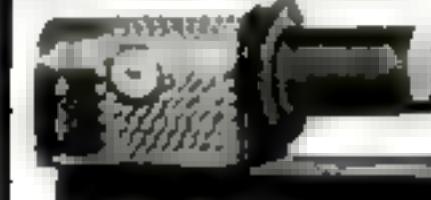
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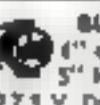
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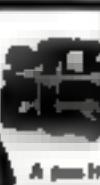
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Starlings: Public Nuisance No. 1

[Continued from page 69]

they have such short memories that a continual barrage is necessary. This is hard on human residents.

Radar and ultrasonic methods are being tried, but so far not very effectively. The dose has to be severe, causing deep irritation or pain or—literally—frying the birds. No ultrasonic whistle like that used on dogs will work: The birds' hearing limits are much like ours.

Bird lovers' fears? Some starling supporters may be alarmed at the dire measures aimed at innocent creatures. After all, the birds do eat many harmful insects. But they needn't worry. You might be able to kill half a million birds in one blow—but the starling problem is many times bigger. Most conservationists agree that the species will survive any mass attacks.

Enlisting Nature. Instead ornithologists are turning their attention to the birds themselves. What about drafting kestrels—their natural predators in Europe? Here, only the common house cat, a species of hawk called "Coopers hawk," and man himself, attempt to fight the birds. (This may be why decoys of owls or sparrow hawks don't seem to scare starlings.)

Are there specific diseases starling flesh is heir to? Some dead birds have shown evidence of disease, possibly carried by parasites that are associated with starlings. Birth mortality is another question. Why, out of a nest of six or seven eggs, are one or two often infertile?

These questions are being considered at wildlife research centers in Laurel, Md., and Amherst, Mass. There, scientists hope to come up with methods as effective as the radiation that turned the tide against the screwworm plague in the South.

This acts as a gametocide—i.e., it interferes with the production of sex cells. Feed the birds the right chemical just before nesting time and enough could be sterilized so that offspring would be limited. A bird birth control, in other words. This would salve the consciences of bird lovers and not unduly upset the already confused balance of nature. It also would leave enough of the iridescent bright ones around for the man with the binoculars to contemplate. ■ ■

It's a Clumsy World for Lefty

[Continued from page 105]

history. The Greeks thought it most unlucky to hear thunder on the left. Before Columbus sailed, Guatemalans were paying serious attention to the antics of a soothsayer's left leg. The seer would rub both his legs vigorously to prophesy. If the right leg muscles twitched, the future looked rosy; if the left leg muscles quivered, watch out!

Even today, primitive African tribes insist that their women prepare food with the right hand. The practice of wearing a wedding ring on the left hand reputedly began as an effort to ward off evil spirits. Even language contains built-in sneers at left-handers. The Latin word for "left" has become our ominous "sinister"; the French word for "left" is now our snooty "gauche."

Social scientists generally believe that because about 90 percent of all people are natural right-handers, the majority early made a virtue of it and decided there was something queer about anybody who was different.

Fancy company. Civilized opinion began shifting slightly in favor of the ill-used left-handers when Alexander the Great came along. Being a lefty seemed to be no handicap at all to him in conquering the world. Then Charlemagne, another ruler who cut a wide swath, found it handier to grip a mace or a sword with his left than his right. This gave left-handedness a substantial boost toward respectability.

Since Charlemagne's time, quite an array of notables have been left-handers. Four great artists are among them: Michelangelo, Leonardo da Vinci, Raphael, and Picasso. Da Vinci, with his usual flair for outdoing everybody else at anything, could write, draw, or paint equally well with either hand.

President Truman always threw out the first baseball of the season with his left hand, but he writes with his right. President Garfield, on the other hand, was a lefty all the way.

In addition to a large and immensely valuable collection of ballplayers who are left-handed, the fraternity includes Betty Grable, Danny Kaye, the cartoonist Milton Caniff, and, now that her secret is out, that elegant snooker player, George VI's widow.—Wesley S. Griswold.

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had been spending about \$2 million a week to buy sabotage and propaganda.

Plans and correspondence showed that Albert and his spies had incited strikes of longshoremen, of munitions workers, and of employees of other plants manufacturing goods of strategic importance to the Allies. The strikes were engineered by Capt. Franz von Papen, the German military attache, with the cooperation of certain labor leaders.

In one case Albert, through dummy purchasers, had actually bought a Bridgeport, Conn., munitions plant that made artillery shells for the British and Russians. The company proposed to accept orders for the ammunition, but never to make shipment, or to furnish defective shells that would be useless against the Germans.

Albert's plans called for purchase of American newspapers and magazines, through which he proposed to influence public opinion in favor of his government. He financed motion pictures with a pro-German slant. Through Albert and Von Papen, the Germans would corner the supply of liquid chlorine, used for poison-gas warfare. Another aim was to deprive England of her supply of cotton from the United States.

ALBERT had personally prepared a gigantic plan for the military occupation of the United States. Some 85,000 German soldiers were to be landed suddenly on the New Jersey coast, out of reach of U. S. coast protective facilities.

The plan included detailed statistics showing that it was necessary for New York City to replenish its food supplies about every five days. The invading Germans were to cut off New York from the rest of the country within 24 hours, to starve the metropolis into submission. With 75 percent of the financial resources of the nation concentrated in New York and captured by the Germans, this occupation would cripple all effective resistance. The first invasion wave would be reinforced by a second, and the United States could be brought to its knees within a short time.

Accurate and abundant information regarding U. S. coastal defenses was among

Albert's papers, including maps of defense stations and strategic military positions along the entire east coast.

WITHIN 24 hours after reviewing the contents of the briefcase, Secretary McAdoo sent both case and papers to President Wilson at the White House. The President agreed that the American public must be made aware of the extent and seriousness of the German plots.

To expose the Germans and to disclose their machinations to as many people as possible, McAdoo talked with Frank I. Cobb, editor of the *New York World*. Cobb was told the entire story and was informed that he would be permitted to publish all of the Albert documents, provided he would keep secret the manner in which they were obtained. Cobb promptly began to make front-page history with banner headlines and illustrations of many of the incriminating papers. Americans who had been fooled by Albert's underlings learned about their mistakes by reading the red-hot stories in the *World*—and promptly moved to sever all connections with those who had beguiled them.

True to his word, Cobb never revealed how the papers were obtained. In later years more than one individual "admitted" that he was the genius who had acquired the Albert briefcase.

In December, 1915, only a few months after the Albert episode, President Wilson demanded that the German Ambassador send Capt. Franz von Papen back to Germany, because Von Papen was responsible for the intrigues aimed at violating the neutrality of the United States. Von Papen returned to Germany, later to become Chancellor under President Paul von Hindenburg and Vice Chancellor under Adolf Hitler.

On April 6, 1917, after the Germans deliberately sank many American ships, the United States entered the war against Germany. German Ambassador Johann Heinrich von Bernstorff was recalled to Berlin, and with him went Dr. Heinrich Albert, whose usefulness as a propaganda director in the United States had virtually ended when Secret Service Agent Frank Burke grabbed his briefcase and got away on a trolley car. ■ ■

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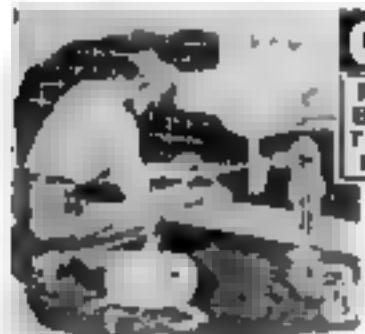
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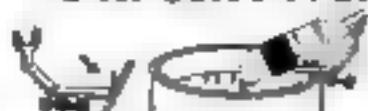
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On the Trail of No Raster

[Continued from page 121]

that it sounded like the chirping of a strange bird.

I replaced the 6AL5. The picture stopped flopping and came on sharp and bright.

I've had customers give me the bird before, but this was different. The Averys insisted on my taking a token of their appreciation. Parakeet, anyone?

The Do-It-Yourself Doctor

OUR family physician, Doc Strouse, is an avid do-it-yourselfer. When he gets stuck, he turns the tables on his patients and seeks free advice over the telephone.

He wastes no words. The other day I immediately recognized the clipped tones on the phone when the voice said, "No raster."

Falling in with the routine, I asked, "Neon test?"

"Negative."

I ran through six ordinary troubles and got six negatives. I pulled the schematic diagram of his set from my files and checked over the high-voltage circuit of Doc's set.

In addition to the high voltage for the picture tube, this circuit produces a by-product—about 400 volts called "B-plus boost." In this set, the boost voltage is fed to the audio-output tube and the vertical-output tube.

I said, "Pull the audio-output tube."

"Can't be that," he came back. "Sound is okay. If the audio tube was bad, the sound would be affected."

"Good thinking, Doc. Pull the vertical-output tube."

He answered, "You're reaching into left field now. It's high-voltage trouble, not vertical sweep."

I insisted. There was a pause, then an excited, "Positive. High voltage snapped on when I removed the 12BH7. How could that be?"

I said, "The tube shorted and loaded down the B-plus boost. The load killed the high voltage. Now, instead of a full raster you have only a bright horizontal line. Right?"

"Right," he snapped.

I sent over a new 12BH7. Word came back that the patient had recovered. ■ ■

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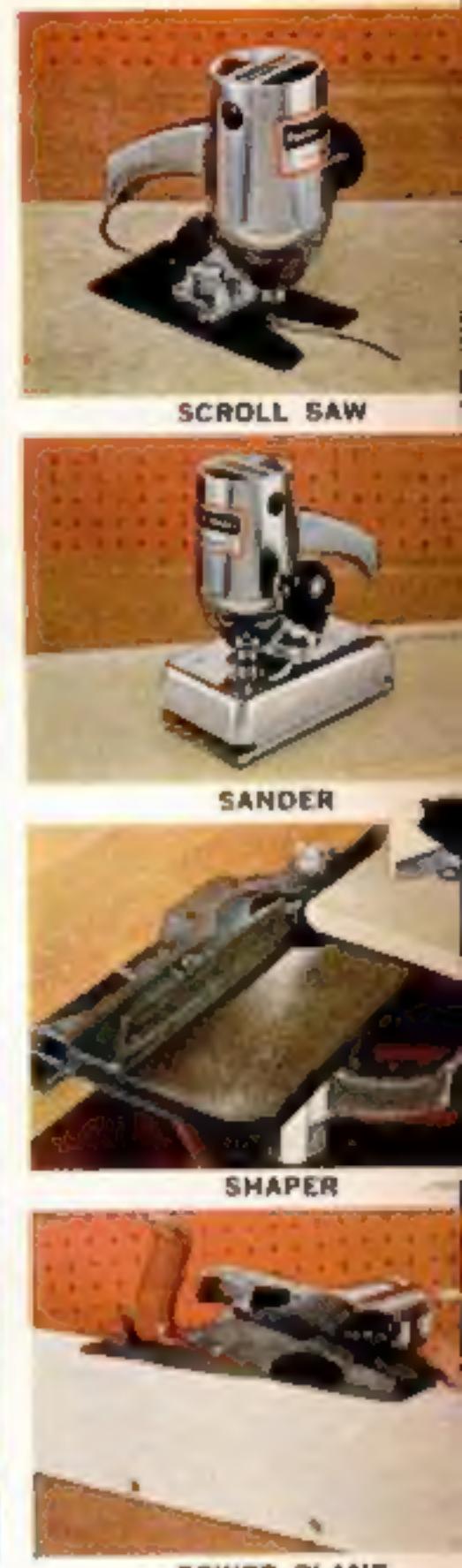
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